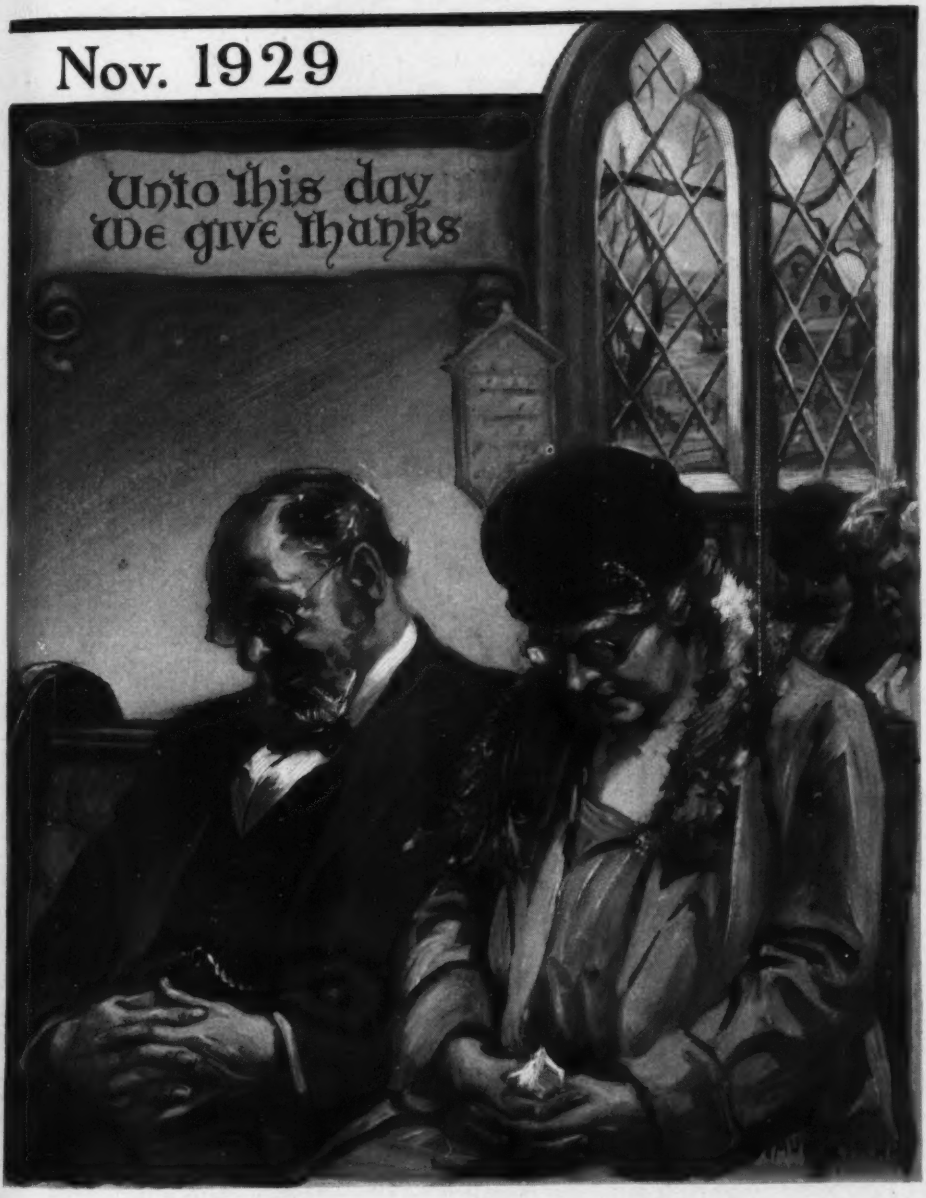
Better Crops WITH PLANT FOOD

Nov. 1929



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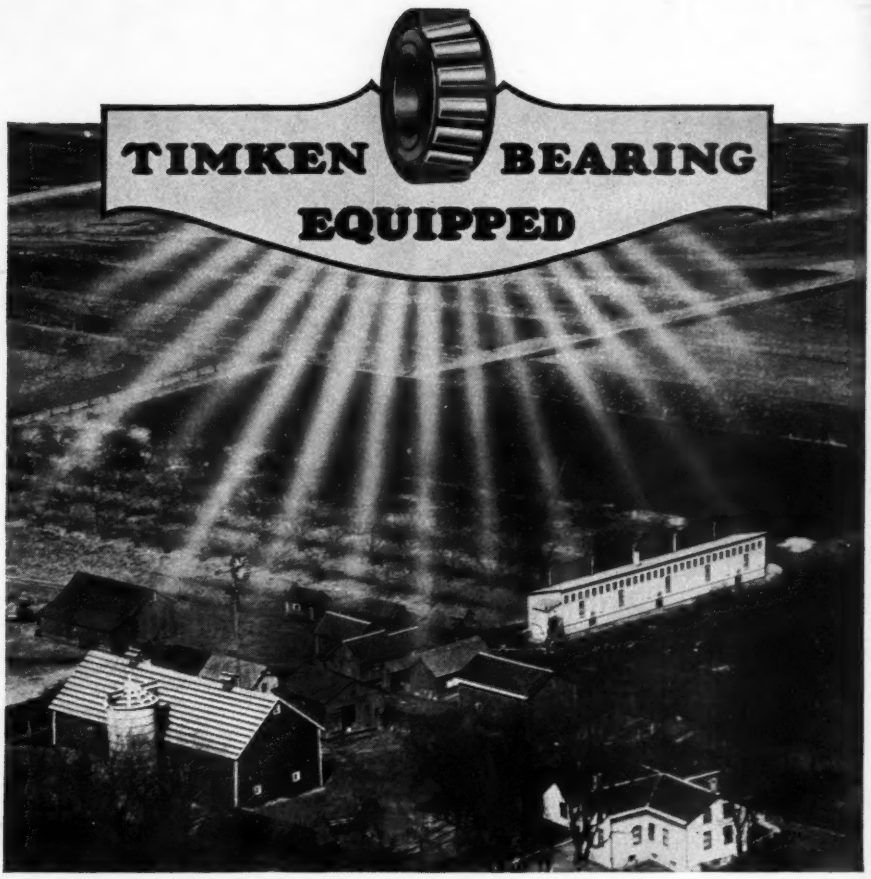

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R. H. STINCHFIELD, *Managing Editor* SID NOBLE, *Editor*

Editorial Offices: 19 West 44th Street New York

VOLUME XIII NUMBER FIVE

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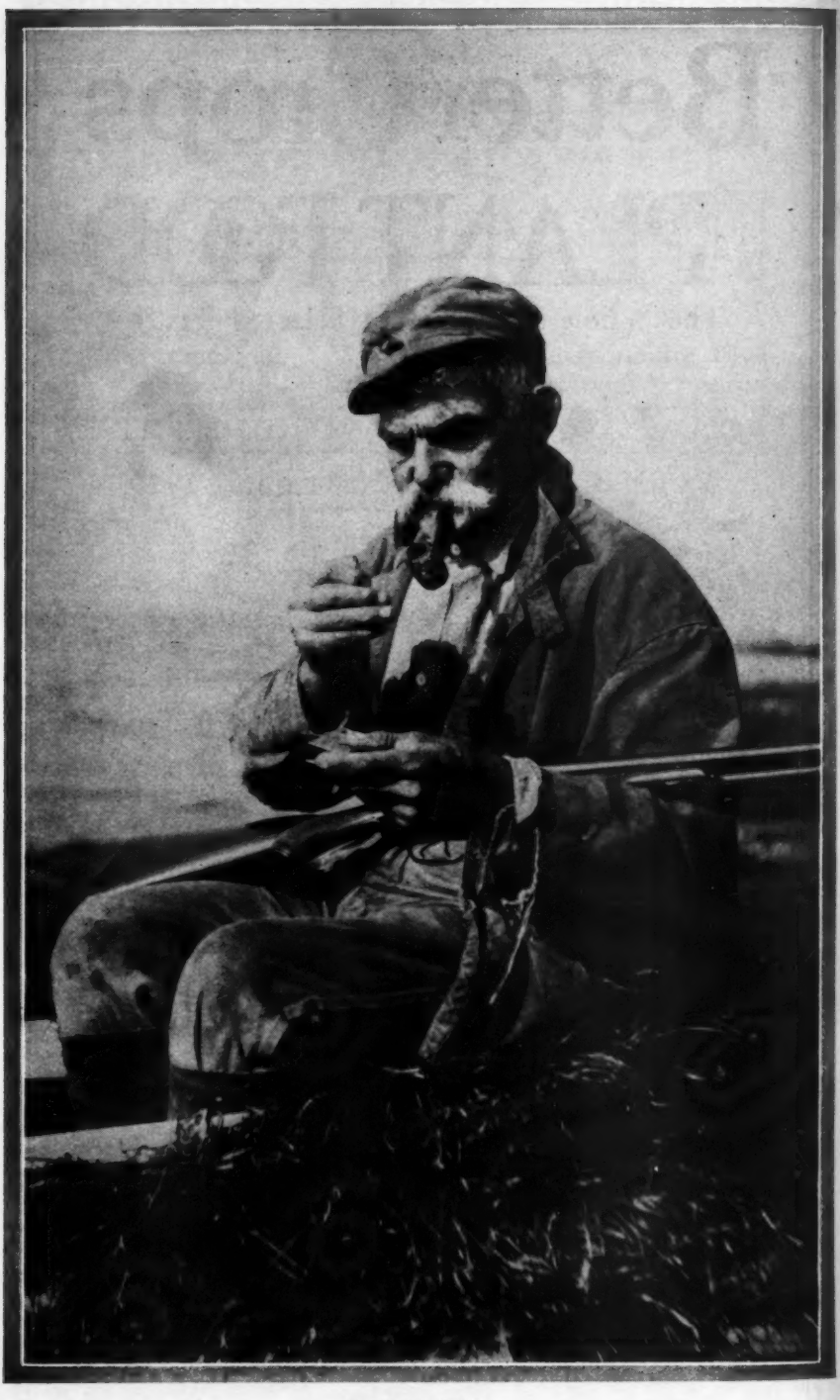

WHILE WAITING

Better Crops with PLANT FOOD

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VOL. XIII NEW YORK, NOVEMBER, 1929 No. 5

Jeff finds much of value in —

Frost Warnings

By Jeff McDermid

UP in my home state the Grand Lodge of Winter is about to hold a congealed conclave. The work will soon open in the zero degree. The anxious home provider is waylaid by three villians of the drama, Jubila, Jubilo, and Jubilum—the coal bin, the wood pile, and the ash heap. By their countenances we know them to be brothers and by their cost we know them to be bothers.

You of the South may be somewhat limited by lassitude, but we of the glacier belt are inhibited by latitude. I know the historic slogan should have been written "Fifty-four Forty and Freeze."

You of the South may find solace in the thought that up here we have to use all *our* wood alcohol in the garage instead of the gin rickey. But our nearness to Canada does not prevent some of us from warming up thoroughly, which is perhaps something of an isothermic paradox.

Frankly, I do not know how I could enjoy living in a land where the houses have no chimneys. Not because I am an inveterate user of economical cigarettes, but because I would miss the annual soot surveys, the bats and swallows, and the vast quantity of home-made creosote with which to preserve my fence posts.

How pleasant it is to mount a gable roof and rub elbows with the last autumn leaves while you point the chimney chinks with plaster! And the chimney sweep! What a lesson in

vocabulary he gives, and what a demonstration in the law of gravity he provides; clad in overalls, mackintosh, and a silk opera hat, doing more with a coil of rope than Will Rogers himself!

When the sweep sounds his trumpet in our bailiwick, it means a paean of temporary victory over the iceman. From now on my money will not melt, even though some of it will burn. I will at least have ashes to scatter on my stubborn soil, left from the sums paid to the bituminous barons.

Just why so many of my neighbors want to use petroleum, coke, or something that is ashless is beyond me. My lifelong observation along and upon slippery sidewalks goeth to the very bottom of things. I am thankful for the furnace residue on such occasions, for they are cheaper than salt and handier than portable cushions.

My father had a wood lot and a base burner and grandfather fed a fireplace with virgin logs. I run a furnace on nothing to begin with but last year's coal dust. Perhaps I should move out on the land and use chips to save checks. But as most of the land is now being reforested, even the farmer has his anthracite anxiety.

Fuel saving among our ancestors consisted of shutting up the parlor and going to bed early. My method is to spend the evening reading up on the British thermal units in various grades of clinkers and let the fire go out. A little morning exercise in the cellar with Carry Nation's emblem gets me in fine fettle to meet the chief or correct my stenographer.

WINTER gets a black eye in most ballads and allegories. Like agriculture, it has had a host of defamers and critics, with but very few defenders. I admire the firmness with which it faces opposition and slander, always coming back regularly if not serenely to do business at the same old storm windows.

Actually I believe Winter is simply obeying the Bible in his own interpretation of the thought that it is necessary to chastise those you love the most. If such is the case, then there has been a lot of natural love misplaced up in our state.

Old age is reckoned in terms of "so many winters," and Youth is said to have enjoyed "sixteen summers." The dramatist mentions the "winter of our discontent." But dear me suz, Old Age may link arms with Winter if he must and say he represents "the last and best of life for which the first was made," or settle down with R. L. Stevenson by the fire and exclaim: "I can now remember the faces of women without jealousy and the deeds of men without envy."

It is not so bad to be in a snowdrift if your heart is warm!

JUNE is the month of happy weddings it is true, but the plots were probably hatched during the cozy season of snuggling in the ingle-nook. In fact, the term "sparking" probably originated when couples sat by the open hearth and built air-castles in the dancing embers.

If my state were a perpetual summer paradise, we should lose the quaint charm inherent in the Oldest Inhabitant, who is consulted at times when almanacs or Indian lore are not available. Paul Bunyan himself was not as facile as one of these. Not only does the O. I. have a retentive memory, but he has what the modern world craves most—expansion and imagination.

Strangely, hot summers and tornadoes do not fire his reminiscent tinder, albeit the tallest stein has outlived the vanished fin for his favorite recollection. It really takes the bitter frost of winter to excite his noblest comparisons, amid the snuffling circle of the hot stove league. California and Florida know him not, for out there all is now as it ever has been—a bleak

(*Turn to page* 62)

A most satisfactory method of growing seedlings has been found in fertilized plots having an area of 48 square feet.

Man-made Forests

By Jerome J. Henry

Wisconsin College of Agriculture

MILLIONS of pine seedlings representing future forests are springing up in the nursery at Nekoosa, Wisconsin. Their roots fed with "milorganite," a product of Milwaukee, Wisconsin, sewage plants, seedlings have grown to greater size in one year than ordinary two and three-year seedlings.

Milorganite is a recently developed product of the sewage disposal plant in Milwaukee. It is a highly available form of nitrogenous fertilizer recovered from city sewage and processed in a large plant.

The nursery plots are also treated with a 3-12-12 fertilizer. About one pound of 3-12-12 and one pound of milorganite are mixed and applied to each plot of seedlings. Ordinary size plots at the nursery are 48 square feet in area.

Paper mills in the territory surrounding Nekoosa, Port Edwards, and Wisconsin Rapids, in the Badger state, are taking an active part in sponsoring the reforestation of the region with trees that are suitable for the production of pulp woods. Already they have a nursery with a capacity of 2,000 acres annually. This acreage calls for about 2,500,000 seedlings.

Expert foresters say that if plantings of this size are made every year for the next 35 years, the vast paper milling industry of the section will have sufficient timber from the plantings to support the industry permanently.

Abandoned farms are being purchased by the paper companies within

a radius of 20 miles of the mills. When these areas are reforested, they will have available a constant supply of logs and will have eliminated practically all transportation costs.

And the foresters are taking every precaution necessary to make their plantings successful. Commercial concerns, in cooperation with the Lake States forest service, United States forest service, and Wisconsin College of Agriculture, are devising methods for efficient and rapid planting as well as adequate protection from fire and other hazards peculiar to pulp wood forests.

To control devastating fires that may start in the planted areas, fire lines are kept clear around each 40-acre tract. Having the width of a well-traveled highway, these lines are ever ready to check invading flames that may leap to the bareness of plowed ground. In addition water pumps are located in the timber so that, once a fire starts, water may be employed to check its spread. Just as soon as the foresters can provide a fire truck it will be installed as a part of the fire protection equipment. Like the modern city fire truck, it will be ready to extinguish blazes as soon as they are discovered.

Realizing the importance of reforestation on a large scale to make the vast paper industry of the state permanent, the Nekoosa companies held a foresters' field day which attracted officials from interested companies in the Lake States, Minnesota, Michigan, and Wisconsin.

The Badger governor, Walter Kohler, when he flew to the site in a modern plane, could look down on thousands of acres of cut-over land which will soon be reforested as a result of the efforts stimulated by the field day programs.

With the nursery producing a constant supply of seedlings nursed along rapidly with fertilizers, vast acreages of cut-over lands will soon be producing potential pulp wood supplies. Once the forests are ready to cut, a constant supply of logs will be available for the mills right at their front door. This will eliminate shipping costs which have to be paid when logs must be shipped from as far as Can-

(*Turn to page* 53)

Millions of tiny seedlings invigorated with applications of 3-12-12 and "milorganite" fertilizers in the vast Nekoosa nursery will produce the pulp for paper used by future American generations.

Fertilizers *for* Sweets

From Pine Shats to High Analyses

By George L. Schuster

Delaware Agricultural Experiment Station, Newark, Delaware

THE sweet potato enterprise is not a new enterprise. It is an old enterprise presenting new problems.

In the report of the Peninsula Horticultural Society of 1892 we find these words from E. H. Bancroft in speaking of manures being poor and carbonaceous or fresh and rich. "That it may be coarse, raw, and mainly carbonaceous seems to be indicated by the use of pine straw and forest rakings in the Eastern Shore, Va. If rich stable or pound manure is to be used, it should be largely mixed with sandy soil and well rotted, otherwise it is liable to stain the tubers, producing the brown color to which the market objects."

Little investigation had been made with commercial fertilizers. Experiments made by Dr. Neale of the Delaware Station about this time indicated the value of potash, while the New Jersey Experiment Station was obtaining best results from the use of bone. These results are conflicting but not alarming in the light of our present day understanding. An application of 500 lbs. of complete fertilizers was as good as 1,000 lbs.

In the report of the Society for 1897, W. L. Elzey of Exmore, Va., stated that he grew sweet potatoes by the use of pine woods manure. He said, "The shats and mold are shoveled up in the autumn and composted with a little good stable or hog pen manure, sufficient to make the heap go through heat. A one-horse load of this manure is spread evenly over every 400 square feet. On rich land the shats are used just as they come from the woods, using about one load to every plot 30 ft. square."

If the land was poor, Mr. Elzey would sow 400 to 500 lbs. per acre of the following fertilizer mixture in addition to the manures.

500 lbs. of acid phosphate
400 lbs. of dissolved bone
400 lbs. of muriate of potash
150 lbs. of kainit
150 lbs. of nitrate of soda
400 lbs. of bone tankage or fish scrap.

If crimson clover had been turned under he recommended 100 lbs. of acid phosphate and 150 lbs. of muriate of potash. He added a word of caution by saying, "The worst failures happen on highly manured rich land."

Later Mr. Elzey said, "The best sweets can be grown on old, worn-out land that has grown up in sedge grass, ploughed shallow in the fall, thoroughly pulverized the following spring, then treated with 1,000 pounds per acre of a fertilizer made of 800 lbs. of dissolved rock, 300 lbs. nitrate of soda, 400 lbs. of muriate of potash, and 500 lbs. dried fish or tankage. Grown on such land they keep better and sell better than when grown on rich land."

Commercial fertilizers came into more general use after this period, and in 1900 we find John J. Rosa of Delaware recording the statement, "I

have known people that have grown sweet potatoes without manure and they would not haul the manure to the field to put on the sweet potatoes if the manure was given to them." Recording further he says, "We use commercial fertilizer and apply about half a ton per acre broadcast."

Two years later Mr. Rosa was using a fertilizer, with a good proportion of fish scrap and rock and 10 per cent potash costing $20.00 per ton, and cleared $1,600 from 15 acres.

Conducts Own Experiment

About this same time J. W. Killen of Felton, Delaware said, "The use of artificial fertilizers has now become a necessity to almost every farmer in this country. In fact, farming without the use of fertilizers does not pay." But he adds a word of caution as to recommendations. "As we all know, there is a great difference in soils, and in order to find the best and most economical means of using artificial fertilizers, I believe that every farmer should be his own experimenter. He should try the various elements of plant food, that is, potash, nitrogen, and phosphoric acid, in different proportions in order to find out that combination which suits best and brings most profit." Valuable advice, even today, but with the aid of the Experiment Station, sub-stations, and field trials conducted by the agricultural investigators of today, most important soil types have been studied as to their requirements. This information relieves the grower of the bulk of the "cut and try" methods of the earlier days.

Mr. Killen, being an investigator as well as a farmer, conducted rather an extensive test on fertilizers for sweet potatoes for four years. The same plots of light sandy loam soil were used for the four-year test. On one series the potash and phosphoric acid was applied in the fall, and in the other the application was made in the spring. The nitrate of soda was applied in three equal installments at different times during the summer on both series.

The accompanying Table I gives Mr. Killen's results. Lime was a question in those days, but with the present knowledge of diseases and their control, lime is not recommended. The highest yield of firsts was obtained from the 3-9.3-11.4 fertilizer applied in the spring. Sulphate of potash did not show any decided advantages over muriate of potash.

Later H. C. Thompson of the U. S. D. A. made the statement, "On sandy soils that are lacking or low in humus, stable manure is recommended as a fertilizer. Heavy applications of fresh manure, however, a short time before planting will stimulate growth of weeds and vines at the expense of the tubers. It is much better to use well rotted manure at the rate of 10 to 15 loads per acre either broadcast or in furrows under the sweet potato row. Where barnyard manure is not available a leguminous crop should be grown on the soil to supply humus. Crimson clover planted in corn will answer the purpose."

"Where commercial fertilizer furnishes plant food, it can be supplied at the rate of from 500 to 1,500 lbs. per acre. A fertilizer analyzing from 5 to 6 per cent nitrogen, 7 to 8 per cent phosphoric acid, and 8 to 10 per cent potash is very good for sweet potatoes."

Post-War Recommendations

Recommendations during this period ranged from 1,000 to 1,500 lbs. of mixed fertilizers of 3½-8-7 to 10, 2-8-12, and 3-8-10. Discussions centered upon methods of application of the large amounts of fertilizers so as not to have plant injury. Broadcast applications of a part or all of the fertilizer at least two weeks prior to planting as well as side-dressing after planting were recommended.

The war period had its effect upon the potash supply and the production

I. MR. KILLEN'S RESULTS AT FELTON, DELAWARE

Plot	Fertilizers per Acre	Approximate formula	Average yields 1897-1900 Incl. Baskets per A.					
			Fertilized in Spring			Fertilized in Fall		
			1sts	2nds	Culls	1sts	2nds	Culls
1	No fertilizer		108	60	40	74	57	36
1a	2,000 lbs. lime		84	65	44	75	75	31
2	200 lbs. Nitrate of soda (N) 615 lbs. Acid Phos. (P)	4-12-0	179	77	54	188	88	47
2a	Ditto + 2,000 lbs. lime	4-12-0	188	84	55	182	87	49
3	200 lbs. N., 615 lbs. P. 120 lbs. Muriate of potash (KCl)	3.4-10.5-6.4	310	89	58	316	101	51
3a	Ditto + 2,000 lbs. lime	3.4-10.5-6.4	320	90	48	331	84	43
4	200 lbs. N., 615 lbs. P. 240 lbs. KCl	3-9.3-11.4	351	58	55	363	87	44
4a	Ditto + 2,000 lbs. lime	3-9.3-11.4	405	94	51	371	89	43
5	200 lbs. N., 615 lbs. P. 240 lbs. Sulphate of potash	3-9.3-11.4	360	67	42	359	93	42
5a	Ditto + 2,000 lbs. lime	3-9.3-11.4	392	73	39	357	93	41

of sweets. In 1918 Dr. T. F. Manns stated, "Sweet potato men who know the crop's requirements are using manure, when they can get it even at high cost. The demand for potash ought to make us preserve carefully every pound of manure."

The more recent investigations have been made by Schermerhorn of New Jersey, Houghland of Maryland, and Zimmerly of Virginia.

Schermerhorn (1924) concluded from his studies that (1) under average conditions, 1,000 to 1,500 lbs. per acre of a 3-8-8 fertilizer will give the best results, the rate of application being modified to meet individual fertility needs; (2) muriate of potash is the most economical source of potash for sweet potatoes; (3) nitrogen in excessive quantities tends to produce long potatoes, while potash produces a chunky type; (4) it is not economical to use more than 8 per cent of potash; (5) organic nitrogen is superior to either nitrate of soda or sulphate of ammonia, but the most economical supply of nitrogen may be obtained through the use of one-half mineral and one-half organic nitrogen.

Houghland (1928) working with a Norfolk sandy loam concluded that a ratio of 60 per cent inorganic nitrogen and 40 per cent organic nitrogen is a satisfactory proportion of each. The yield of primes produced with Leunasalpeter plus organics was somewhat higher than that obtained from nitrate of soda, but about the same as that produced with sulphate of ammonia in a 3-8-8 mixture. Green manures of rye and vetch used in the rotation of white potatoes and sweet potatoes gave significant increases in sweet potato yields. Working with a 3-8-8 fertilizer he found that applications of between 1,000 and 1,250 lbs. gave the highest yields. Sulfate of potash ranked first as a source of potash, then muriate of potash, and manure salts in a 3-8-8 and 3-8-10 mixture, but muriate was first in a 3-8-5 mixture. Concentrated fertilizer (6-16-16) was tried at half rate (750 lbs.) for one year with satisfactory results. A

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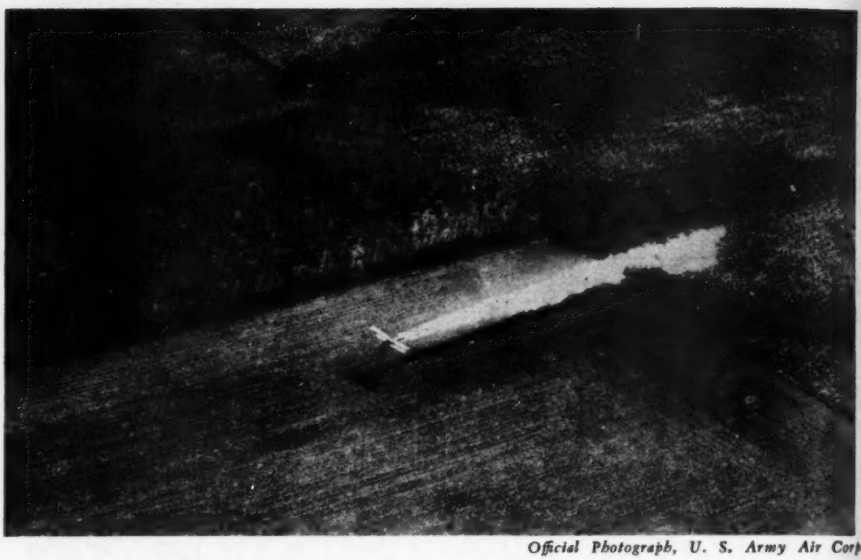


Official Photograph, U. S. Army Air Corps

Experiments have been successful in spraying poison dusts and broadcasting seeds from airplanes.

What's Ahead?

"The optimist the doughnut sees,
The pessimist the hole."

¶ A New Series

By Frank George

AGRICULTURAL historians 50 years from now are going to be puzzled at several paradoxes that occurred in the 10 years following the World War.

They will read volumes about a financially embarrassed agriculture coincident with unprecedented prosperity among industries that sell goods to farmers, and they will wonder where farmers got the money to pay for these goods. Where, for example, did farmers get the money to pay for more than 1,000,000 tractors between the years 1918 and 1930?

They will read the opinions of leading agriculturists of the day that increased farming efficiency which resulted from the use of tractors, combines, corn-huskers, and other machinery was in large part responsible for the so-called surplus problem, and they will wonder at an agriculture that bought more and more of farm machinery in order to dig itself deeper in the financial hole.

But regardless of these and other anachronisms, the historians will be generally agreed that the so-called agricultural depression following the World War was a great blessing in that it stimulated a laggard industry, in the industrial sense, to take stock of itself and to reorganize on a basis of equality with other industry. They will see the beginning of an industrial era in agriculture to the point where, by the year 1980, almost double the quantity of crops and livestock grown in 1930 will be produced with about one-half the

man power used in the years following the World War.

Agriculture 50 years from now will be no more like the agriculture of today, than is the agriculture of today like that of the year 1880. The past 100 years have been a period of extensive farming. It was cheaper to cultivate new lands than to intensify on old lands. But now we are entering upon a period of intensive farming. Last year, American farmers used approximately fifty-eight million acres to produce less than one billion bushels of wheat, or an average of one acre for every 15 bushels. The day will come when they will grow one billion bushels of wheat on half that acreage.

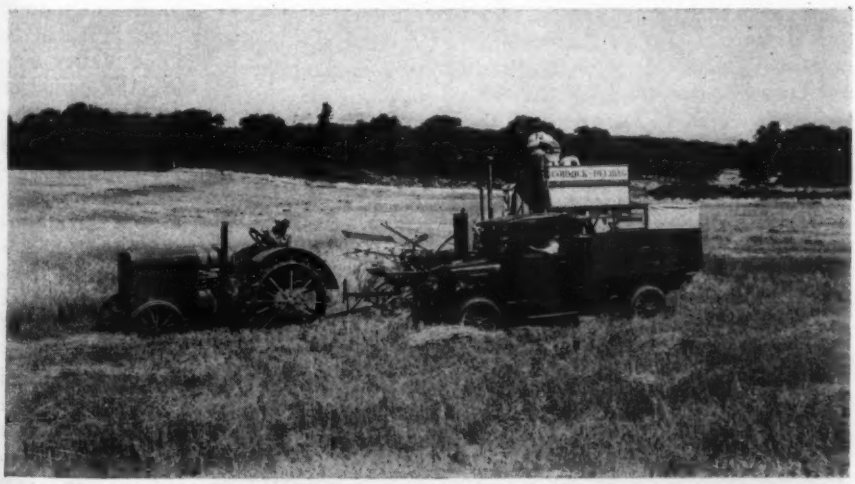
With our present agricultural set-up, to be sure, one-half the wheat acreage in the United States could not be taken out of production. But as the demand for wheat increases, there need be no increase in the present acreage. The time is shortly at hand when acreage cannot be expanded, and the only way to satisfy the increased consumption demand will be through greater production per acre. European producers reached that condition many years ago, with the result that today, in some countries, wheat and other grain production per acre is on the average more than double that in the United States.

Recent land utilization surveys show that practically all of our good arable land available for use without reclamation is contained in our present crop area. With the greater part of our available agricultural area already in use and a population that is growing at the rate of 1,400,000 persons a year, the problem of productivity and soil fertility in their relation to our future food supply is becoming of increasing importance.

Surface Only Scratched

It is expected that the increasing demand of our steadily growing population for food will result in a level of prices that will economically justify the wider use of improved methods of production. That means the use of better cultivation methods; development of more suitable rotations, including the growth of legumes; more efficient use of crop residues and animal manures; greater use of commercial fertilizers, and the more common use of selected seed.

American farmers have made some progress in increasing acre yields in the last 40 years, but they have barely scratched the surface of possibilities in



An economical and efficient power-farming combination is a tractor and harvester-thresher with a truck for hauling the grain.

that direction. The statistics show that from an average of the 5-year period 1885-89 to the 5-year period 1920-24 the combined acreage of corn, wheat, oats, and potatoes in the United States was expanded about 52 per cent, whereas the total production of these crops increased 77 per cent.

The rise in the yield per acre of these crops during that period of 40 years made available annually during the half decade 1920-24 more than 800,000,000 bushels of corn, wheat, oats, and potatoes more than would have been realized under the yield level prevailing at the beginning of the period. In other words, the increase in total production as a result of the rise in acre-yield level provided the population of the United States annually with about seven bushels more of these crops per capita than would have been available under the acre-yield level of the base period 1885-89.

The larger part of this increased yield per acre was secured for the most part in the older farming regions east of the Mississippi River, in regions that according to popular notion were "worn out." In the early decades of the last century the belief was general that virgin fertility in the older settlements was coming to an end. Crop yields were low in contrast with yields to be obtained on the cheap lands west of the Appalachians, and farm abandonment in the East was regarded as an evidence of soil deterioration. But the East, faced by the new competition from the West, launched upon a program of soil improvement, and yields began to rise.

Other Increased Yields

During the last 40 years there has been a marked increase in corn yields in the northern portion of the South Atlantic States. Corn yields during that period in the North Atlantic States increased from 6 to 10 bushels per acre; in the East North Central group from 6 to 12 bushels; and in the northern section of the South Atlantic States (comprising Delaware, Maryland, Virginia, West Virginia, and North Carolina) from 9 to 14 bushels per acre. The averages of the quinquennial period of 1885-89 compared with the averages during the half decade of 1920-24 in Iowa and Minnesota show increases of 6 to 8 bushels per acre.

Wheat yields for the several States have increased during the 40-year period from 5 to 6 bushels per acre in the northeastern States. There was a marked decrease in average wheat yields in Ohio and other States in the Ohio Valley during the period of 1920-24, but this was largely the result of unfavorable weather conditions during the years 1920-22, inclusive. In Kansas, despite the expansion of wheat acreage into the semi-arid portion of the State, yields have remained prac-

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An outfit like this will plow from 12 to 15 acres in one day.

How Businesslike Should a Farmer Be?

By Arthur P. Chew

FARMERS probably have to put up with more uninformed outside criticism than most other occupational groups. They get it from all sides. Your tyro in science declares the farmers depend too much on rule-of-thumb methods. The wage-earner says farmers have a comparatively soft snap, watching the crops grow and charging the city consumer fancy prices when the products are harvested. The business man thinks the chief trouble with the farmers is that they are not businesslike. He recommends the adoption of factory efficiency on the farm.

But what does all this criticism amount to? Nothing, because it is not based on knowledge. This country has some six million farmers. That number should be a fairly representative sample of the population, neither better nor poorer in character, intelligence, and energy than any other group of comparable size. Its methods, in its own line, are unquestionably better than any methods that outsiders could suddenly improvise. It is a notable fact that those who know the farmers best are the last to disparage them. Among federal and state extension workers, the most valued means of improving agriculture is study of the methods used by the most successful farmers. The criterion of good practice in agriculture is sought in the logical place, that is to say on the farm itself.

This does not mean that prevailing farm practices are necessarily the best that could be employed. Not the most enthusiastic champion of the farmers could seriously maintain such an absurdity. It does mean, however, that any practice in wide use probably has considerable merit and justification, and that proposals to change it need the test of experiment as well as of theory.

Recently a dairy extension man, full of enthusiasm for his specialty, recommended a degree of emphasis on dairying in a certain locality that the farmers there knew to be impracticable. They had facts about rainfall and forage production that the dairy expert had overlooked. It happens constantly that expert advice, when applied to particular farm problems, needs to be seasoned with local lore based on experience.

The Need for Records

When "outlook" work became popular among agricultural economists, it seemed to indicate possibilities for rather quick shifts in production to suit changing market requirements. Experience showed, however, that general economic information must be related to the needs of particular farms before it has great value as a guide in production. Types of farming extant in this country are the result of long experience and cannot be remade overnight.

Perhaps the criticism most frequently leveled against the farmers is that they are not sufficiently businesslike. Involved here is the question how businesslike should a farmer be? Can he afford, and is it necessary for him to keep books, watch costs, maintain a budget, and husband labor-time

as industriously as the average trader or manufacturer does? It goes without saying that there is room for improvement in business practices on the farm. Probably the post-war depression would have been much less damaging to agriculture had a knowledge of business realities enabled the farmers to prepare for it.

Much farm work, for lack of sound accounting, is done for nothing. Many farmers do not receive an ordinary interest return on their capital plus an average wage for their labor. They work in this unsatisfactory way because they do not realize their true situation. Capital can earn interest without exertion on the part of its owner, and labor can earn wages without possessing capital. Many an unbusinesslike farmer could improve his condition by selling out, investing the proceeds of the sale, and working for wages.

Farms Are Not Commercial

But the average farm is not a place of business in the same sense as a factory or a store. Indeed, only yesterday, historically speaking, the farm was not a place of business at all. It was primarily a source of foods and fibers for home consumption; production for sale was secondary. The farm is still far from being completely commercial. Perhaps that is why it is usually still far from up-to-date in its business technic. In short, the relative backwardness of agriculture in business methods has an obvious historical and economic explanation.

Hence criticism of the farmers on the ground that they are unbusinesslike is pointless. More useful is an inquiry into the question how rapidly are the farmers bringing their methods into conformity with the requirements of a business age. An astonishingly large proportion of the farms in the United States are still predominantly in the domestic as distinguished from the commercial stage of production. These farms yield only trifling commercial surpluses, and rely heavily for their incomes on products furnished by the farm for home consumption.

Studies in the department of agriculture indicate that nearly 40 per cent of the country's farm population live on small farms of poor and difficult land, on a comparatively low standard of living. Naturally, however, it is not these farms that furnish the bulk of the agricultural products offered for sale. Production for the market is mainly in the hands of a body of farmers as intelligent and efficient as can be found anywhere in the world. Recent technical progress in American agriculture has enabled American farm workers using mechanical power to produce from two to five times as much as similar workers produce in the older countries of Europe. It might be expected that a group of producers thus alert to keep in the forefront of technical progress would not be altogether lacking in a sense of the value of up-to-date business methods. That is what we actually find.

Probably 20 per cent of the farmers of the United States keep accounts in some form, and many of them do so in an entirely adequate manner. More than 80,000 farmers applied to their county agents in 1927 for simple farm account books of the type recommended by the U. S. Department of Agriculture. Twelve thousand sought aid in summarizing their accounts, and 16,000 more obtained expert help in analyzing their costs of production. These farmers thus learned the cash results obtained from different combinations of crop and livestock enterprises, and ascertained what changes were advisable in their cropping systems.

In one county in Kansas a group of farmers have kept accounts for several years under the direction of a group of Farm Bureau leaders. The records in the early years indicated a general failure to handle the largest possible area per work horse, and also inadequate production per milk cow.

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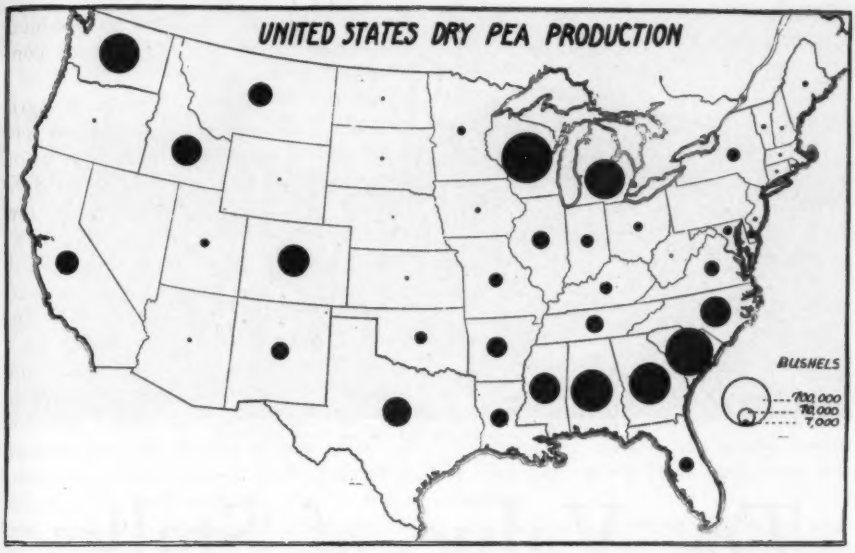

Dry Peas

¶ *Twelfth in this series*

By Walter H. Ebling

Agricultural Statistician, Wisconsin

THE term "dry peas" refers to peas of various kinds which are ripened and harvested in the seed form. It means quite different things in various parts of the United States, some dry peas being produced in nearly every State in the Union. Formerly, the United States grew well over a million acres of the various types to be harvested as dry peas, but in post-war years there has been something of a decline and the production is now under a million acres. At the last census the crop had a value of $21,000,000.

From the standpoint of total acreage, the cow-pea is probably the most important of the peas grown for seed. It is grown largely in the southeastern United States and is represented by a prominent area extending from Virginia to Texas. It is essentially a cotton belt crop with South Carolina leading, followed by Georgia and Alabama. In 1928 it is estimated that for various purposes nearly 2,000,000 acres of cow-peas were grown in the United States. Much of the average, however, is used for hay and

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A corn-stalk harvester in use in an Iowa cornfield.

The Value *of* Stalks

By A. A. Burger

Cedar Falls, Iowa

THE industrial chemist holds in his hands one of the keys that will unlock some of the now hidden secrets and future possibilities of agriculture. These will be found in the utilization of the waste, the by-products of the farm.

Most of us have already seen the beautiful rayon-silk fabrics that have been made from the corn-stalk. But not so many of us know that corn-stalks now are made into wall-board, insulating material, movie films, explosives, paper, and many other materials that may be made of cellulose, for cellulose constitutes 35 to 40 per cent of the stalk.

Cost Becomes a Problem

The corn-stalk is the source of a new kind of raw material which bids fair to have an important effect upon our future. The only question is the cost of this raw material and the price at which it can be placed upon the market at a profit.

What are these stalks worth to the farmer when left upon the farm? What are they worth to the farmer after he has collected them? Do these costs make them too expensive for commercial use? These are now important and pressing questions of the Corn Belt. On the answers depends the acceptance or rejection of a new industrial advance.

Professor O. R. Sweeney of Iowa State College has already demonstrated the possibilities of the corn-stalk as a source of raw material, and is now at work with the United States Bureau of Standards to develop new technical and chemical methods of handling the stalks in order that their use may be both practical and profitable to the farmer and manufacturer.

Professors J. B. Davidson and E. V. Collins of the same institution are at work collecting material on the cost of collecting the stalks. With a combination of a mowing machine, hay

loader, and hay baler, pulled by a tractor, they were able to harvest the stalks after the ears had been removed by the usual method, at a cost of $3.12 per ton. Adding $1.70 per ton for hauling to the factory, the total cost of collecting and delivery was $4.82. This item does not include the fertilizer value of the stalks.

Other Cost Data

In Illinois, in 1927, one company collected 10,000 tons of stalks in a commercial way at a cost to the company including collecting, baling, hauling, and compensation to the farmer for the stalks, of less than $8 per ton. The average haul here was 15 miles. Some of the stalks were delivered at a distance of 20 miles, at a cost as low as $5.70 per ton. These operations took place during a very unfavorable season, the stalks were badly down and the ground abnormally wet. The company feels that the cost might be reduced to $6 per ton or even less, without reducing the compensation to the farmer.

In Grundy county, Iowa, L. W. Plager, county agent, who had charge of the corn-stalk project in that county, gives a cost figure of baled stalks at the farm of $8.50. The method of collecting here was to break the stalks with a railroad iron when they were frozen in the early fall, rake them into piles, pitch them onto a wagon, and haul to the baler. The farmers received $1.50 for the stalks. The company furnished the baler so that practically all of the balance of this cost was paid to the farmer — he was given preference in doing the work on his own farm at the rate of 40 cents per man hour, 20 per team hour, and $1.25 per hour for a tractor to run the baler. Plager estimates that it was possible to break 40 acres of stalks in 10 hours, rake 17 to 18 acres, and haul 12 acres to the baler. An acre of good stalks would make a ton per acre, and an acre of heavy stalks more.

Last year Grundy county baled 13,000 bales, averaging about 90 pounds per bale. Plager thinks that while the price paid to the farmer for the stalks was not high, the amount paid to him in the way of labor which he furnished during the slack season of the year made it a profitable enterprise.

In Illinois a favorite method of collection was to cut the corn in the field with corn binders, deliver it to the crib on wagons where it was run through a husker-shredder, the ear corn being elevated into the crib and the baled product loaded onto five-ton trucks ready for the run to the factory. This work was done by the company. The farmer thus received about $2.40 per ton for the stalks—estimating that his corn would go 40 bushels per acre and the cost of husking at six cents per bushel.

County Agent L. W. Plager directed the baling of stalks in Grundy county, Iowa.

It is evident that the prices of labor involved for the mechanical operations are relatively easy to determine. From the standpoint of the farmer, they are the least important, for he is concerned primarily in the price paid him for the stalks, that is, where he cannot apply his own labor in doing the work. It is quite largely a question as to what is the fertility value of the corn-stalk. Here eminent soil chemists, practical farmers, and county agents differ very widely in their estimates and opinions. Some place this value as high as $5 per ton; some as low as 45 cents. Some say that it is more economical to remove the stalks from the land; some that it would eventually ruin the country.

Now what are the facts? First, the opinion of Professor Stevenson of Ames: In the past a good many teachers handled the subject by stating that a ton of corn-stalks contains about 16 pounds of nitrogen, 2 pounds of phosphorus, and 17 pounds of potassium, and an amount of organic matter about three times as large as that found in a ton of manure. At the present market price of these three elements of plant food in commercial fertilizers, a ton of corn-stalks would be worth about $3.84. In addition, the organic matter in the stalks would probably have some beneficial effects on the physical condition of the soil. This factor, however, cannot be definitely determined.

On the face of it these figures seem to give corn-stalks a rather high fertilizer value. But there is another side which merits consideration. Sir John Russell, the well-known English authority on soils, makes the point that well-rotted straw is an example of an effective manure, and undecomposed straw of a non-effective manure. If corn-stalks are put in the same class with straw, from the standpoint of the type and rate of decomposition that normally takes place in the soil, it would seem that stalks would not prove to be very effective as a fertilizer. They would probably tend to allow the micro-organisms in the soil to multiply greatly, and this might tend to diminish the amount of nitrate available to the crop and unfavorably effect crop growth.

Experiments on the fertilizer value of straw and stover (corn-stalks) carried on at the West Central Experiment Station in Minnesota are of interest. They were started in 1916. The rotation was wheat and corn, both plowed under in the fall at the rate of none, one ton, and two tons per acre, the corn stover for the wheat and the wheat straw for the corn. The yields were as follows:

Corn.

No treatment	39.1 bu.
Straw, 1 ton	40.9 bu.
Straw, 2 tons	40.5 bu.

Wheat.

No treatment	17.9 bu.
Stover, 1 ton	19.2 bu.
Stover, 2 tons	20.2 bu.

The increase in the corn crop was a little over one bushel per acre and that of the wheat a little under two bushels per acre.

Bear of the Ohio Experiment Station, says that if corn-stalks are plowed under in the spring, they tend to

Corn-stalk wallboard coming from press rolls on way to dryer.

In the preparation for wallboard manufacture, stalks are well shredded.

cause molds to grow in the soil which are very harmful. The molds actually rob the plants of the nitrogen which they would otherwise get. We know, also, that in the process of breaking down the cellulose of the corn-stalk, nitrogen is consumed, and that means the nitrogen stored in the soil. This process of decay does not take place appreciably except when the stalks are in contact with, or are covered with the soil. The utilization of the stored-up nitrogen in the soil is the reason why so many soil chemists do not credit to the corn-stalk as high a fertility value as their chemical analysis would seem to indicate.

What then would be the fertilizer replacement value of the stalks? Professor Sweeney says that it would be about $2. And he points out that if we replace the nitrogen, phosphorus, and potash which they contain by buying these materials on the open market from firms furnishing commercial fertilizers, that their value would be still less. In other words, he says that a ton of stalks will not give the same returns that $2 worth of commercial fertilizer will give.

In his close anaylsis of the value of the stalk, Professor Sweeney goes still further. He calls attention to the fact that the most costly element of plant food which the stalk contains —16 pounds of nitrogen, which would cost, roughly, 16 cents per pound—is very cheaply grown by the farmer on the farm in such crops as clover, alfalfa, sweet clover, soybeans, etc., and the practice of supplying a part of the plant food by this method very greatly reduces the estimated plant food value of stalks.

Professor Sweeney points out that many farmers of the Corn Belt evidently do not consider the stalks of very much value, for in many instances they follow the plan of burning them. This has been especially true over large sections of Iowa where they are extremely heavy. The fact that stalks are often very troublesome in plowing under, always bother more or less in cultivating the growing crop, interfere seriously often in the preparation of a good seedbed for small grains and especially for such

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What Potash Has Meant *to* Evangeline Parish

By Auris Mayeux

Principal, Vidrine High School, Ville Platte, Louisiana

THE Evangeline Country as immortalized by Longfellow in his wonderful poem "Evangeline" is familiar to every high school boy and girl, particularly as a land of romance and beauty. From the stage of this beautiful setting comes the following story, not of romance and beauty, which is yet unsurpassed, but of economical discovery which has added hundreds of thousands of dollars to the annual income of these Acadian farmers. It was a descendant of these French Acadians of early pilgrim days who is largely responsible for this important discovery.

Evangeline parish, located in the southwestern part of Louisiana, is largely prairie land just sufficiently rolling to assure good natural drainage without soil erosion. The soil is fairly uniform of type, ranging from the Crowley silt loam to a fine sandy loam with a light colored clay subsoil about 10 to 14 inches below the surface.

In this land of plenty it was the popular opinion that fertilizers were not needed; in fact, many thought that the producers of fertilizers were schemers who were trying to swindle the farmer out of his hard-earned money. Eventually a few of the more enterprising farmers used a few sacks of superphosphates, about 12 per cent available, and obtained good results. Within a few years superphosphate became generally used and was thought to be all this soil needed. Some of the fertilizer manufacturers later introduced a fertilizer sold under the trade name of "Rawbone," which analyzed 1.65-10-2 (N-P-K) and proved more satisfactory than superphosphate alone.

In 1911 the first agricultural course in the parish (county) was offered in the Vidrine High School. In the courses offered, the boys learned abstractly the different plant food elements and some of their functions. It was an assumed opinion of the instructors as well as others of authority that our soil contained a plentiful supply of potash, this opinion being based on chemical analyses of soils similar in nature to that of this locality. The boys who were conducting home projects were advised to use superphosphate at time of planting, with a side-dressing of nitrate of soda at time of first cultivation. Results obtained were much better than from superphosphates alone. Potash continued to be studied

An Evangeline Parish Cotton Queen

Auris Mayeux compares at his right a stalk of cotton grown on soil where no potash was used with a stalk at his left which got an ample supply of potash.

as a plant food of which some soils were likely to be deficient but not our soil, and was regarded by most of the students as a plant food in theory but not really practical.

Prior to 1923 there had been no potash used as fertilizer in this parish except the small quantity contained in the above mentioned 1.65-10-2 (N-P-K). It was in this year that, as a former student of the above mentioned high school and a graduate of the agricultural course of the Louisiana State University, I became the agricultural instructor in this high school. In order to conduct some field tests independent of the school plots, I purchased a 32-acre farm near the school. This farm had become so unproductive that the owner could no longer make a living on it. The usual production of 11 acres planted in cotton was from two to three bales because of rust, which in the months of July and August would cause the cotton to die. I now rented the farm to the original owner.

Introduces Potash

Springtime came and with it, time to purchase the supply of fertilizer. It was proposed to the tenant that he use some potash in fertilizing his cotton. On learning the cost of muriate of potash per hundred pounds he refused, stating that he could not afford to pay such a high price for a new fertilizer when he could get superphosphate at less than half that price per hundred pounds. I then proposed to buy the potash myself if the tenant would apply it, and at the close of the harvest, if in the opinion of the tenant the potash paid a profit, he was to reimburse me. To this the tenant agreed, and 500 pounds of muriate of potash were purchased.

The tenant applied his usual amount of 100-200 pounds of 16 per cent superphosphate before planting. At the first cultivation the potash was applied as a side-dressing at the rate of approximately 100 pounds per acre. In order to be sure to detect the effect of the potash, if any, it was applied on four rows and four rows were skipped, continuing this method across the 11-acre field.

The result was very marked, four rows of healthy, vigorous cotton loaded with a full crop of mature bolls sandwiched with four rows of small rusty and dead cotton with inferior,

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Fall Care *of* Orchards

By T. J. Talbert

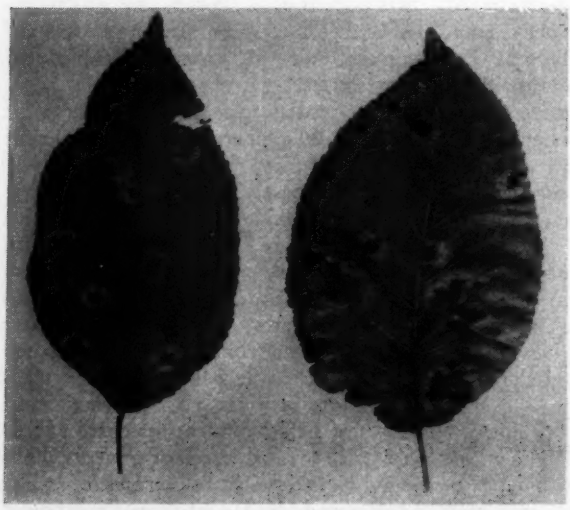
Professor of Horticulture, University of Missouri

FALL and early winter treatment to rid the orchard of serious insect pests and diseases is in many ways the best one of the year for effective results. This is true because the grower, to cope with orchard enemies successfully, must take advantage of them at every opportunity. The grower may have more time at this period to study his trees and their needs. The days are generally fine for work and much may be accomplished in a comparatively short length of time.

In the fall many insects are in a dormant or semi-dormant condition. Some pass the winter in the adult stage, others in the pupa or resting stage, some in silken cocoons or other especially prepared places in the larvae or worm stage, and still others may be found wintering in the egg stage. The orchardist is fortunate when he knows the stage of development and where these pests spend the winter. He may then be able to destroy them successfully at his leisure.

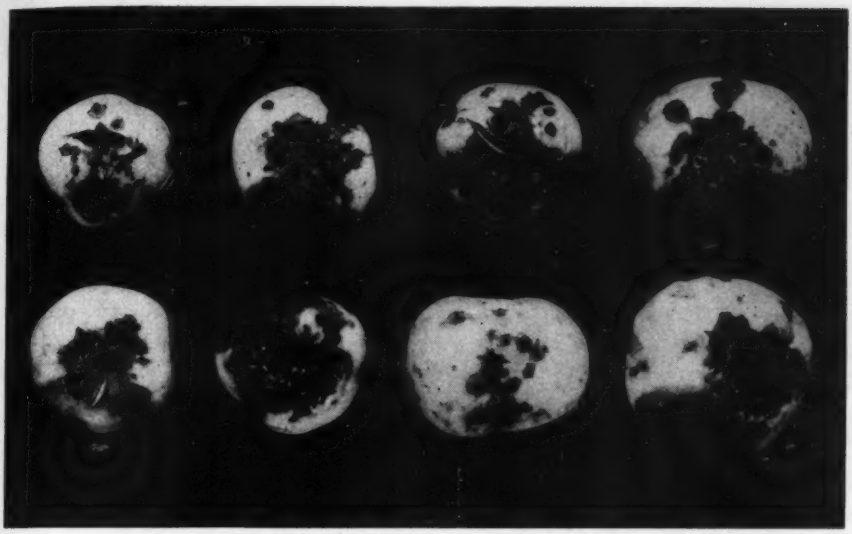
Destroy All Refuse

All wormy, decayed, knotty, and what are generally termed cull apples should be removed from the orchard, fed to the hogs, or buried a foot or more in the earth. If such precautions are not taken with cull apples, they may furnish a serious source of codling moth infestation the following spring and summer. From 10 to 50 per cent of such cull apples often contain codling moth larvae. Fungous diseases like apple scab and black rot may winter over in such fruit.



The top and bottom sides of apple leaves showing injury by cedar rust.

All dying trees, branches, and dead wood, as well as trash and litter, should be removed from the orchard, made into fire wood, or carefully burned. Blister canker, black rot canker, as well as other diseases, are destroyed by such measures. Apple tree borers may also be combatted effectively by such clean-up practices. Over-wintering codling moth larvae, which are tucked away in silken



These apples have been ruined by a bad infection of apple scab.

cocoons in cracks and crevices of the bark and in the crotches of branches and under branches, trash, and litter on the ground, are destroyed. Such material affords over-wintering quarters for some of our most dangerous insect pests and diseases.

Late fall and early winter plowing may do much toward the control of apple scab. This is true because the disease passes the winter mainly on the fallen leaves. When these are buried deeply beneath the furrow slice, the spores do not have a chance to escape to the air and infect the foliage and fruit in the spring.

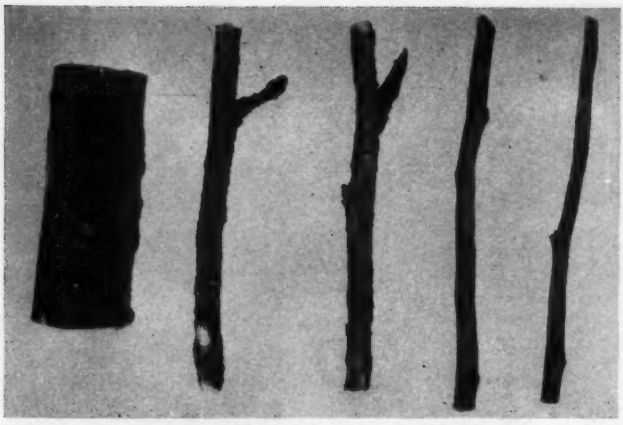
Apple blotch passes the winter on the infected or cankered twigs and branches. Careful pruning during the fall and winter in nice weather should enable the grower to get rid of most of the sources of infection, and thus lessen materially the fight with sprays the following spring and summer.

During the late fall and early winter, if the apple trees have been banded, the bands should be removed and the over-wintering larvae under them destroyed. The rough bark on the trunks, large branches, and in the crotches of the branches should be removed. In so doing, many larvae will be killed. Such work will lessen greatly the number of the first brood of codling moth. This means, of course, a reduced attack of worms the next year.

Cedar rust injury on the apple fruit.

Dead and dying branches and trees are frequently heavily infested by borers. The destruction of these by burning is effective in cutting down later injury.

Young apple orchards should be gone over in the fall or early winter and examined for the presence of borers. Injury will usually be found at the base of the tree trunks where chain-like masses of sawdust may be found, marking the hole through which the borer may be removed or destroyed. Use a sharp knife in cutting away the infested area, making the cuts up and



An apple branch and twigs injured by blotch.

down as much as possible to avoid girdling the trees. Injury to the trees by cutting may be avoided and time saved if a stiff wire is used as a probe. It may be made serviceable by nicking the probing end with a hatchet.

Cedar rust, a fungous disease of the apple, cannot be effectively controlled by spraying. It is, therefore, necessary to cut all red cedars growing within one or one and one-half miles of apple orchards. The fungus has two hosts, or food plants, the red cedar and the apple. Closely related fruits like the crab apple and the haw are also injured by cedar rust. Late fall and early winter is an effective season for cedar eradication, as the trees may be seen long distances and the orchardist may have more time to search them out, cut, and burn them.

If San Jose scale and peach leaf curl must both be combatted, these troubles may be controlled by using lime-sulphur 1-7 or a 2 per cent lubricating oil emulsion with bordeaux made according to the 3-4-50 formula. Where San Jose scale is not present, the bordeaux alone or lime-sulphur 1-15 or 1-20 is effective. One spraying is sufficient and it may be made in the fall after the leaves drop or in the spring before growth starts. In the control of peach leaf curl it is imperative that the work be done before the buds swell in the spring. For both San Jose scale and peach leaf curl thorough spraying cannot be emphasized too strongly. Unsprayed or partly sprayed buds may show scale and curl.

The only safe way to prevent rabbits from gnawing the bark of the trunks of young fruit trees is to wrap the base of the tree trunks from the ground to a height of about 18 to 20 inches, or the space between the ground and the lowest branches. Where the branches are less than 18 inches above the soil, the wrappers should include both trunk and branches. Various kinds of wrapping material may be used. Some of the most common are one-inch mesh poultry wire, galvanized window screen wire, galvanized wire netting having 3 or 4 meshes to the inch, old newspapers, gunny sacks torn in strips 6 to 8 inches wide, and corn-stalks. Wood-veneer wrappers, patented wire wrappers, tarred paper, and building paper may be bought and used.

The wrappers should be placed around the tree trunks about the time the leaves drop in the fall. All except wire should be removed early in the spring as growth starts. Wrappers like newspapers, gunny sacks, corn-stalks, building paper, wood-veneer, etc., wrapped around the tree trunks may form a harbor for insects and diseases if left on the trees during the spring and summer. The bark of the tree trunks when so inclosed will not develop normally. The permanent wire wrappers do not have these disadvantages and may remain around the tree trunks without attention except to see that they stay in place until the trees are six to eight years old. The

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VERMONT

Agricultural Experiment Station

By Leon W. Dean

University of Vermont

"THE Vermont Station is one of the least of the sisterhood," says it director, Dean Joseph L. Hills. He ought to know. He has been director from 1893 to date and dean of the College of Agriculture of the University of Vermont since 1898. He is now dean of American Experiment Station directors in active service and likewise dean of deans of agriculture in active service. Those who have known the solicitude with which through the years he has watched over and built up the agricultural interests of his state will tell you that he is also many other creditable things. But he is a modest man. Perhaps that is one reason why he has thrived so long and successfully. Modesty, although it may have gone out of style with the styles, is still considered a virtue in staid New England. Dean Hills, then, is a modest man and might neglect to mention that—

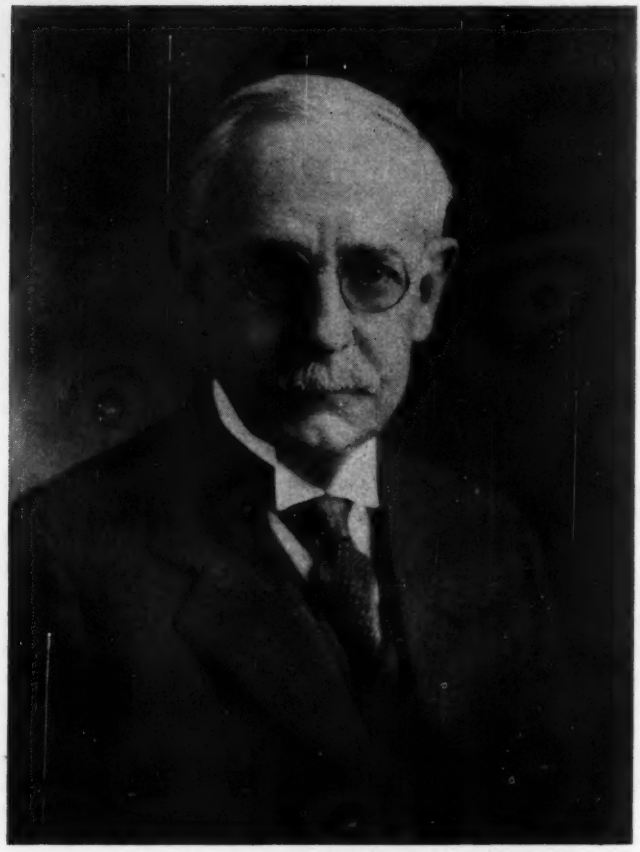
(1) One of the two official methods now employed the country over for the detection of the use of relatively unavailable forms of organic ammoniates in commercial fertilizers was devised and perfected at the Vermont Station.

(2) One of the several successful and simple methods for measuring so-called soil acidity, or better called "lime requirement," was devised at the Vermont Station.

(3) Some 10 years ago, a bulletin was published, the only one of its kind issued by an American experiment station, describing the methods employed in commercial fertilizer manufacture. This bulletin represented its author's own experience during his early years in the chemical oversight of a fertilizer factory and visitation to and study of a considerable number of modern plants. The bulletin has been widely used in school and college classes.

The late Senator Justine S. Morrill of Vermont, Father of the Land Grant College Act, from a portrait now hanging in Morrill Hall, agricultural building of the University of Vermont and State Agricultural College.

(4) The usual fertilizer control work has been carried out, being now in its forty-seventh year, during forty-two of



Dr. Joseph L. Hills, Dean of the College of Agriculture, University of Vermont, and for 36 years Director of the Vermont Experiment Station.

which it has been under the oversight of the present director.

The Vermont Station was established by state law in 1886, and with no partisan politics on the university campus, with a tendency on the part of Vermonters to stand loyally back of those who serve them well, oversight of the station has changed less often than has that of any other station in the country save those of Pennsylvania, Ohio, and Wisconsin. Dr. Hills' only predecessor was W. W. Cooke, director from 1886 to 1893. It is also interesting to note in this connection that Mr. C. H. Jones, the experiment station chemist, began service in New England stations 39 years ago and is outranked in point of years of service only by the station chemists of Maine, Massachusetts, and New Jersey.

Vermont is almost the smallest state in the land in terms of population and wealth and does not finance agricultural research work. The General Assembly of 1886, which created the station, appropriated $3,500 to start its work, derived mostly from fees paid in by fertilizer companies, but this sum was promptly withdrawn with the first Federal appropriation act passed.

Vermont's area is small and her tillable area is still smaller, but her bovine population is as large as her human population. Her farmers every year buy between ten and fifteen million dollars worth of grain, consisting largely of dairy feeds. Her soils, which are inherently the most fertile in New England, have had more natural manures applied to them than have the soils of any other state in the Union. They are, speaking broadly, relatively rich in organic matter. The calcium content of her pasture grasses is distinctly higher than is usually found elsewhere. Her Green Mountains are green and "there's a reason" why they are green.

All this explains why the Vermont Station has paid relatively little attention to the study of plant food

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Potash Starvation *of* Irish Potatoes

By E. R. Lancashire

Extension Specialist, Ohio State University

AT a field day meeting held at the Ohio Experiment Station last year, attention was called to the fact that some of the potato plants appeared to have a bronzed cast to them. On other plants an abnormally dark green color was beginning to appear.

The experimental fields were in charge of Dr. John Bushnell. His explanation for the appearance of the abnormality was as follows: "On plots receiving no manure and no potash in fertilizers, potato plants took on an abnormally dark green color, became stunted in midseason, produced small tubers, and died prematurely with a characteristic abscission of the lower leaves. The abnormal color was due to an accumulation of blue pigment, which is normally present in small amount in varieties of the Rural group; varieties that do not have this blue pigment became bronzed instead of bluish green.

"Chemical analyses of the tops of such plants disclose an accumulation of soluble sugar and a deficit of hydrolyzable polysaccharides. Qualitatively the carbohydrates seem to be normal. It thus appears that in the growing plant the conversion of soluble sugar to polysaccharides is impeded by the deficit of potassium, and as a result of the accumulation of sugar, glucosidal pigment is produced in abnormal amount, and presumably normal photosynthesis is retarded."

Substituting the words of the street for those of the scientist, it might be said that the plants starved to death. This happened not because of a lack of soluble sugars but because the absence of the element potassium prevented the conversion of such sugars into starches and celluloses and into other substances used by the plant in building up its complicated vegetative structure. The photograph used to illustrate this article tells the story of the potatotes that starved to death much better than any number of words could possibly do it.

An Easy Test

A very simple way of telling whether or not any particular plant is starving to death because of a shortage of potassium is that of pulling off a few of the lower leaves. If the leaf parts from the main stem of the potato vine readily and without a peeling away of the outer skin on the main stem the plant is suffering from the lack of the element potash. Should the leaf show a tendency to separate from the main stem only after a decided effort to remain attached, the condition is normal and the plant is supplied with at least a moderate amount of potash. This tendency was referred to by Dr. Bushnell when he described a potash deficient plant as showing a characteristic abscission of the lower leaves.

In the fertilizer experiments carried on at Wooster, Ohio, some very interesting effects have been noted in connection with the elements nitrogen, phosphorus, and potassium. An attempt has been made to find the influ-

ence of the several fertilizer elements upon the number of tubers set per plant and upon the size of the tubers.

As far as the effect of fertilizers on the number of tubers per plant is concerned the work shows that nitrate gave an increase in number of tubers per plant when added to four of five basic treatments and that where either potash or phosphate alone was deficient in the basic treatments, the addition of this deficient element increased the number. So nitrogen increases the number of tubers per plant irrespective of the supply of potash and phosphate.

Potash Influences Size

In regard to the effect of fertilizer on the size of the tubers, the most outstanding fact is the consistently large increase from potash. Potash is clearly deficient in all the plots of the experiment in which it is not added in the fertilizer treatment. The effect of potash on the tubers was very largely confined to increasing their size.

As compared with the effect of potash, the results from nitrate and phosphate on the size of the tubers are negligible. The only increases in size from these elements are found when the basic treatment is potash alone or potash plus nitrate. To these basic potash treatments, an addition of phosphate or nitrate has a small effect in increasing the average size.

These effects may be generalized: A deficiency of potash has resulted in small tubers; relieving this deficiency by the application of 100 pounds per acre of muriate of potash increased the size of tubers about 50 per cent. Where this potash application was accompanied by 160 pounds of superphosphate there was a further small increase in size.

In general nitrate increased the number of tubers per plant, but had no appreciable effect on the size of the tubers. Potash had a marked effect in increasing the size of tubers but no consistent influence on the number. Phosphate had no effect on number and comparatively little effect on size of tubers. As the soil had a high lime content, the phosphate may have been largely converted into an insoluble form, and this may account for the negative results from the element.

While no one as yet can say definitely with any degree of certainty just how much and what kind of fertilizers should be used for the potato crop, it might be interesting to note that nitrogen does not pay consistently. In some years when the season is cool or when the potatoes are planted real early, the use of nitrogen has paid liberally. Big increases in yields have been noted. This refers to the use of chemical nitrogen on fields which include clover in the rotation.

Phosphorus is particularly beneficial on acid soils. The amount used depends on how heavily the field has been fertilized during the years previous. The residue of this fertilizer element accumulates over a period of years when applied in excess of the amount needed to meet the particular requirements of the crops grown. It is suggested that if the soil has no accumulated residue that from 10 to 12 per cent of superphosphate be included in the complete fertilizer used.

Potash Improves Quality

Quality in potatoes, especially when grown on muck soils, depends upon the presence of the needed amount of potash. Even on good soils potash pays on potatoes. Just how much should be used is another question. It would seem that at least six per cent of potash should be included in every potato fertilizer.

The following list of fertilizer mixtures are suggested as basic treatments for the various soils: On light colored sandy soils which have received barnyard or green manures, a 6-8-6 applied at the rate of 800 to 1,200 pounds per acre in the row, for the

The premature dying of the plot at the left is due to potash starvation. This plot receives superphosphate only. The plot at the right gets potash.

early potato crops; a 4-10-6 can be used in the same way for the late potato crop on this type of soil. On light colored silt loams, clay loams, or clays which have been manured, the fertilizer used is often a 6-8-6 for the early crop and a 4-12-4 for the late crop. On dark colored soils such as silt loams, clay loams, or clays which have been manured, the early potato crop receives a 4-10-6 and the late crop a 2-14-4. On mucks and peats which receive neither barnyard nor green manures, a 3-9-18 is used on the early and late crops. In all cases the fertilizer is used at the rate suggested above and is applied in the row at planting time.

In the end the potato grower will find it profitable to try out the several fertilizer elements in varying amounts. A reasonable amount of investigation should pay good returns in the intensive business of raising a profitable potato crop. Perhaps the best illustration of what kind of fertilizer pays best on the potato crop can be found in an analysis of the fertilizers used by men who produce yields of 400 bushels and more per acre. It would seem that men who can do that are on the right track in most of their practices.

Records kept by 29 potato growers last year show that the average fertilizer mixture used in producing yields above the 400-bushel mark was a 3.7-13-7.4. The average amount of nitrogen used was 3.7 per cent of the total number of pounds applied per acre. The figure for superphosphate was 13 per cent and that for potash was 7.4 per cent.

The following list of mixtures was included in the figures used in arriving at the composite fertilizer analysis used by these successful potato growers:

Applied broadcast

500	pounds per acre	2-12-6
600	" " "	3- 8-6

Applied in the row

1,000 pounds per acre	2-8-16

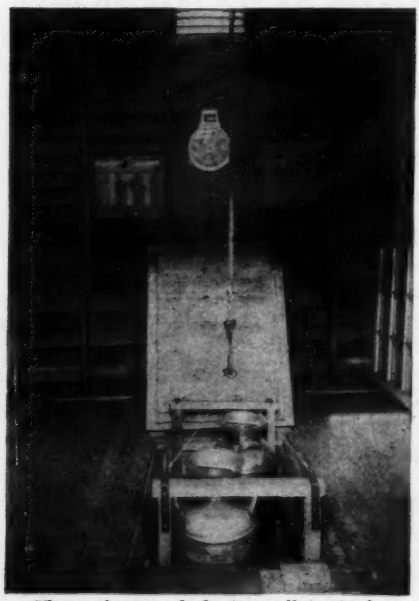
(*Turn to page* 50)

Ice Wells May Solve Farm Refrigeration

IN many of the Northern States the "ice well" may be the solution for the farmers' refrigeration problem. The Bureau of Dairy Industry of the Department of Agriculture and the North Dakota Agricultural College have cooperated in testing out the ice well and report good results.

The ice well consists of a pit in the ground in which a large solid cake of ice has been formed by running a small quantity of water into the hole daily during freezing weather. The well tested at the United States dairy field station at Mandan, North Dakota, followed closely plans suggested by the Saskatchewan Department of Agriculture.

On a well-drained spot near the milk house and convenient to the well, a pit was dug 8 feet square and 9½ feet deep. The sides were boarded up with cheap lumber and the bottom covered to a depth of 1½ feet with coarse gravel to insure good drainage. A small house was erected over the pit. The floor was of two thicknesses of planking with building paper between the layers, and it was built in sections to permit easy removal during freezing. Windows in the house provided air circulation in the winter, but were closed during the summer. A wooden rack or basket suspended from a pulley overhead served for raising and lowering the cans of cream and other food in storage.



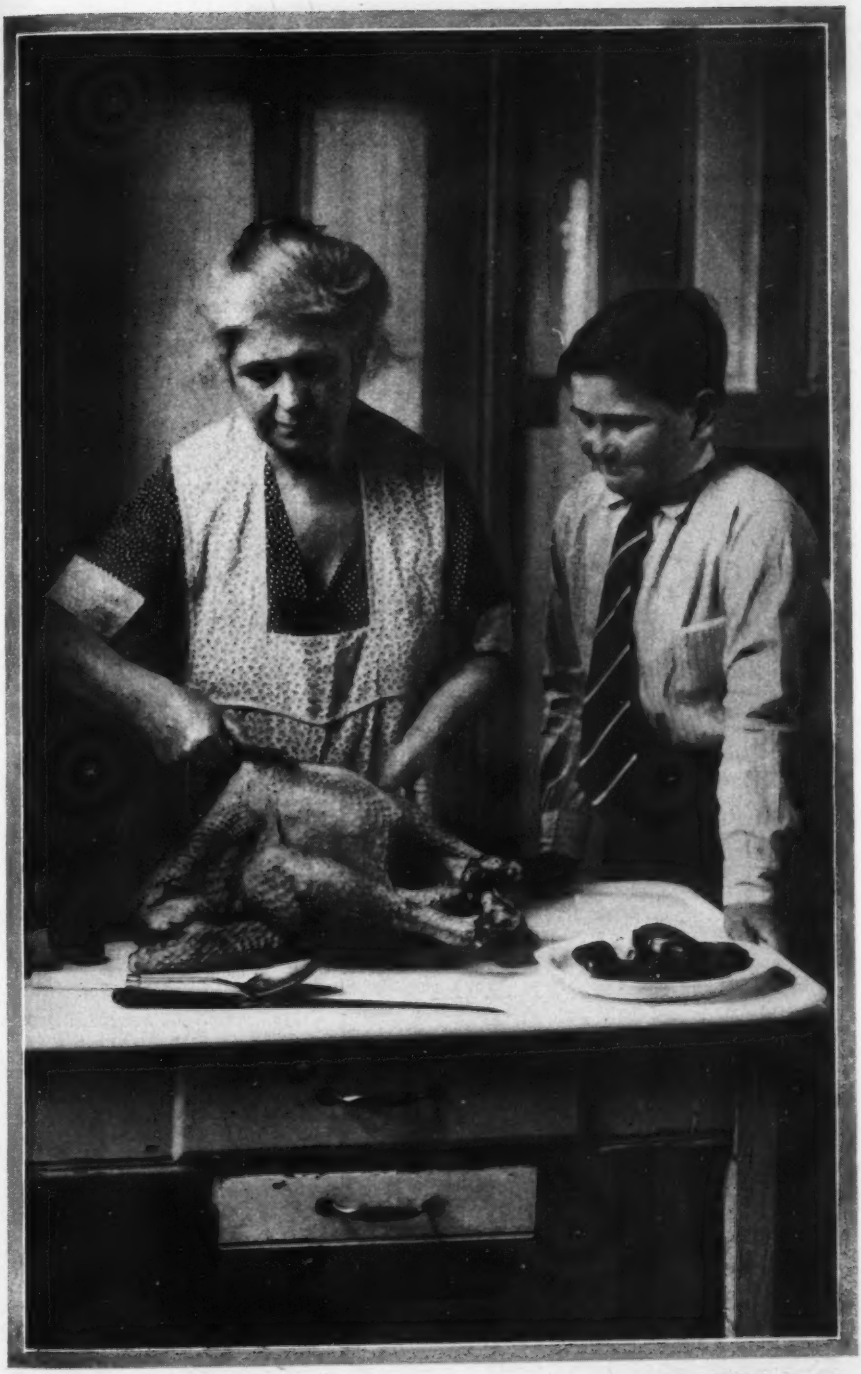
The mechanism of the ice well is simple.

Freezing was started in January. A small quantity of water, two to four gallons, was run into the pit each day. By the end of February there was a solid cake of ice 8 feet square and 6½ feet deep. When freezing weather was over, the house was closed tightly and the floor replaced.

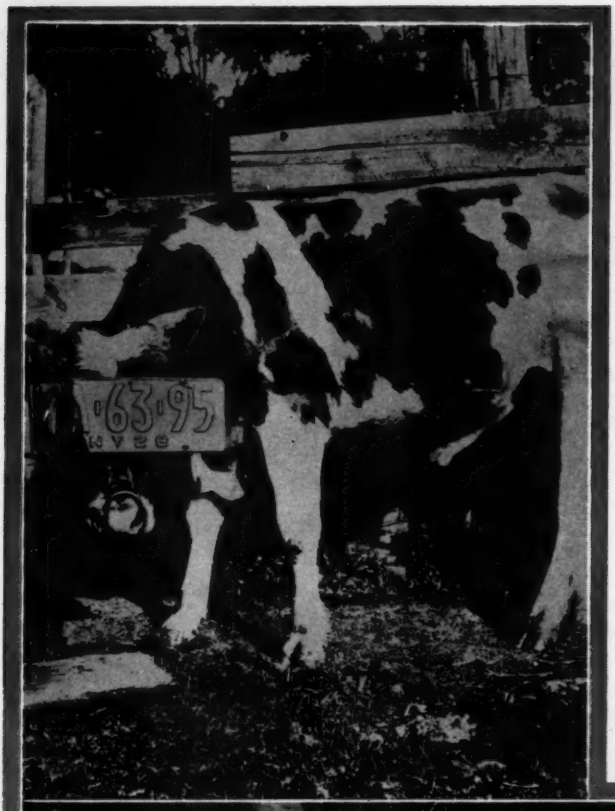
Storage of cream was started May 25. The ice lasted through the summer, and September 1, after a storage period of 98 days, there was still a block of ice 68 inches square and 22 inches deep, or 58 cubic feet of the 416 cubic feet in the original block. At the same rate of melting the ice will last until well into October.

Careful records were kept throughout the summer. Cream cooled with well water to 56.5 degrees Fahrenheit and placed in the rack in the pit at 8:30 a.m. was cooled to 48 degrees within three hours and to 42 degrees by 4:30 p.m. Cream in cans placed directly on the ice was cooled to 34 degrees in the same period. Cream was kept in a perfectly sweet condition for

(*Turn to page* 52)



WORKING UP A THANKSGIVING APPETITE



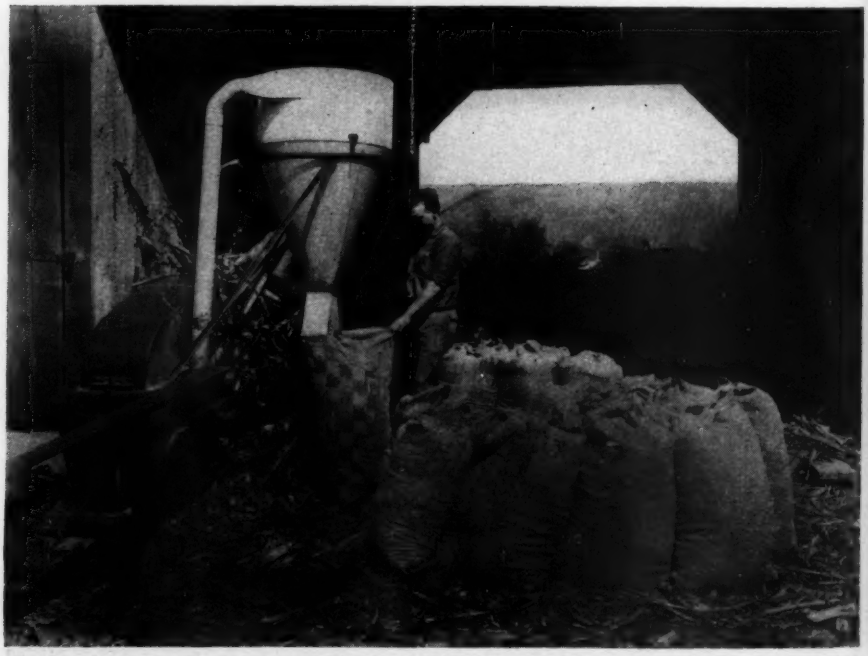
Left: A New York farmer has found a new and good use for old automobile license plates.

Below: R. R. Graves of the United States Department of Agriculture has developed new milking equipment to reduce the cost and labor of milk production, facilitate the keeping of records, and produce a cleaner product. The milk, after being drawn into a stationary glass container suspended from a weighing mechanism, is drawn on out through pipes and goes to the cooling and bottling equipment without contact with the outside air.

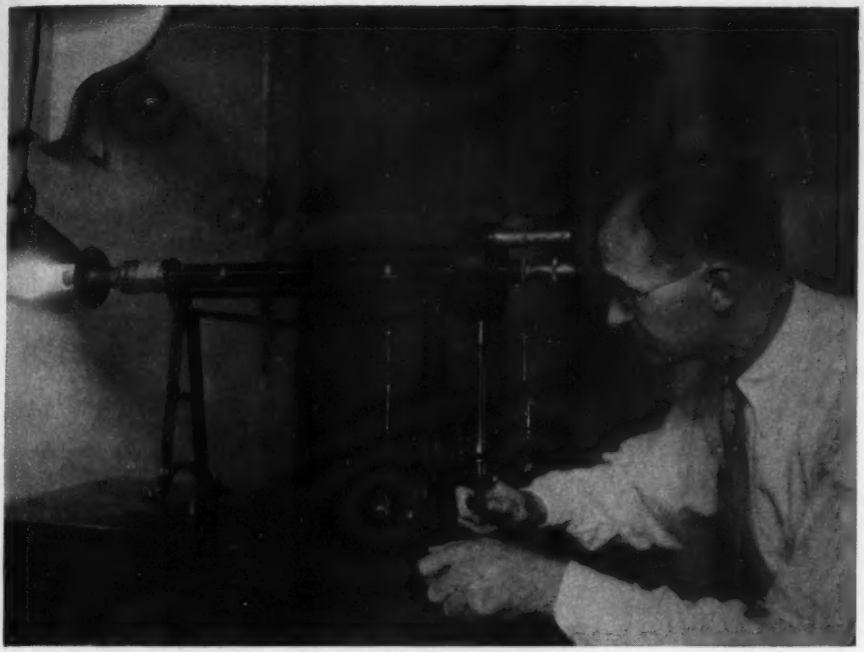
Right: At the recent National Dairy Show held in St. Louis, the United States Department of Agriculture had in its exhibit a plaster man with mechanical hands apparently drawing milk from a cardboard cow. This was one means used to attract attention to the importance of sanitary equipment in the production of milk.

Below Good beef in the making is evident in this picture of 280 Hereford steers around the feed troughs on the farm of Livingston Bros., Monroe, Iowa.

H. G. Leslie, Governor of Indiana, could not find an egg broken in this basket dropped by parachute from an airplane 1,000 feet in the air. At the Governor's right is Dr. E. C. Elliott, President of Purdue University, and at his left are Professor L. H. Schwartz and Dean J. H. Skinner of the Purdue School of Agriculture.

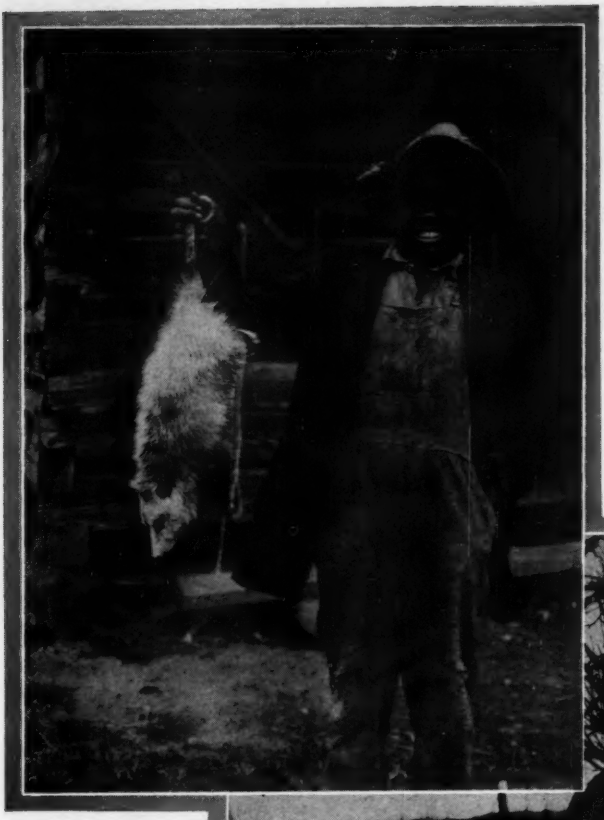


This Maryland dairy farmer uses a mill to grind the entire corn plant—ear, stalk, and leaves—thus saving his cows a lot of hard work.



Dr. R. W. Bell, United States Department of Agriculture, recently discovered a commercial process for making a new form of milk sugar, of great value as a constituent of infants' food and in the diet of patients suffering from intestinal disorders. The new milk sugar tastes good enough so that it will be taken as a food rather than as a medicine.

This team weighing 3,630 pounds and belonging to George Wilcox, Greenville, Ohio, recently broke a world's record in heavy-weight horse pulling with a tractive pull of 3,500 pounds.



Left: His Thanksgiving dinner is assured.

Right: Trapping is a profitable winter pastime with many farmers.

The Editors Talk

Cooperation

A new and deeper significance has been given to cooperation among farmers by the creation of government agencies whose function it is to make loans to aid the farmers. The cooperative movement has grown up. It is here to stay and it will grow.

This newer significance brings a new problem in its train. Or probably to be more correct, adds dimensions and acuteness to the old problem of the relation of established trade to cooperative trade. In other words, how can the established trade that deals with the farmer live in peace and harmony and make all the living it wants to in rivalry with the cooperative organizations that naturally want to buy in the cheapest market and sell in the best.

There is one thing certain—the solution of this problem as the cooperative movement grows will not be worked out in any one sitting. Neither will it be worked out by the use of any high-sounding and magic formulas. Any lasting solution will require a solid basis of a study of local and regional problems in specific markets of purchase and sale. But the main thing required before any solution will be found is a mental adjustment that it is far more profitable for established trade and cooperatives to learn to get along with each other. Trade might as well realize that cooperatives are here to stay, that they will thrive and grow in spite of anything that established trade can do, and that adopting a policy of ignoring the cooperative movement will in the end result in failure.

On the other hand, the cooperatives might realize that business has been established to provide goods and service, that it is entitled to a fair profit, and that where it is providing such service for moderate profits, these facts should be recognized in the policies of the cooperative movement. These points of view are very essential before anything will be accomplished in doing the greatest good for the farmer. And as it is only as the farmer profits that either trade or the cooperative will thrive, why not tackle this problem of adjustment between each other.

Fertilizing for Quality

We hear a great deal of talk about the quality of crops and the need for stressing quality as well as yield.

For this reason results of cooperative fertilizer tests on tomatoes conducted on the Eastern Shore of Maryland are of significant interest. For the past two years different fertilizer analyses have been compared, particularly to ascertain the effect of potash on the canning qualities of tomatoes. Such analyses as 4-8-6, 4-8-10, 4-8-12, and even 4-8-18 and 4-8-20 have been used, the object being to get a wide range in the amounts of potash used in order to get definite results.

In the results, it is found that 1,000 pounds per acre of a 4-8-12 produced 366 baskets, while the same amount of a 4-8-18 produced 614 baskets per acre. Using less fertilizer per acre, 500 pounds of a 4-8-6 produced 210 baskets, but the same amount of a 4-8-18 produced 364 baskets. Again on another demonstration, 1,200 pounds of a 4-8-10 produced 467 baskets, while a similar amount of 4-8-20 produced 585 baskets. These figures relate to the yields only, but what of the quality of the tomatoes when canned?

Canning tests were conducted at two points during the past summer. In one case a four-basket sample was taken from the plots. But in the other case, a whole day's picking was canned. In the first case, four baskets from the 4-8-18 plot packed out 84 cans, which is an average of 21 cans per basket, or 1,260 cans per ton of raw product. This was in contrast to the high average for the factory of 16 cans per basket, or only 960 cans per ton of raw product. Thus, the higher analysis produced a definite increase in the amount of tomatoes packed from a given quantity of the raw product.

The second test showed an average of 16 cans per basket from the 10 per cent potash plots and 18 cans per basket from the 20 per cent potash plots, while the high average for the factory was 14 cans per basket. In other words, if all the tomato growers hauling to this factory had used 20 per cent potash and obtained similar results from its use, this factory would have averaged 240 cans more per ton of raw product than its high average.

The tomatoes from the plots where the higher analyses of potash were used had thicker cell walls, fewer and smaller seed cavities, and much more meat than tomatoes from the low potash plots. In addition, the tomatoes from the high potash plots were better shaped, had better color, and fewer cracks and other defects.

If the canning industry is to compete with the truck growers putting fresh vegetables on the market, it is highly important that the quality be of the best. It would seem, therefore, that the management of canning factories should be intensely interested in the use of well-balanced, high-grade fertilizers and that they might well encourage tests with fertilizers to find out, not only which analysis will yield the best, but which analysis will pay them the biggest profit after the tomatoes have been packed. And with larger returns at lower costs per can to the canners, they in turn will be in better position to increase the price to the growers of quality raw tomatoes.

An October Meeting

The work and meeting of the Association of Official Agricultural Chemists which is held every October should be better known. As the title indicates, the Association is formed chiefly of the official agricultural chemists from each State, members of the staff of the United States Department of Agriculture, and from other official bodies. "The eligibility of every member is conceded by virtue of the position he occupies and it continues only so long as such position is held."

The Forty-Fifth Annual Convention of the Association was held in Washington October 28 to 30.

In addition to hearing papers on fertilizers, feeding stuffs and sugar products, insecticides and fungicides, dairy products, drugs, and many other subjects, the meeting is a unique opportunity to meet people interested in the new development in these important fields. For instance, what does high

analysis fertilizer mean exactly? What is the thought of the leading agricultural chemical workers on this subject? Again, a vast amount of research and practical work is going on in connection with new forms of nitrogen and concentrated fertilizer materials.

The Association appoints a number of committees, among them a Committee on Definitions of Terms and Interpretation of Results on Fertilizers. This Committee holds a meeting at each annual convention where many important matters relating to fertilizers are discussed. This is an excellent place for representatives of industry to become acquainted with the developments in the fertilizer field. The whole convention is an excellent place to obtain a good idea of the trend of activities in other important fields of work, and as one of the big jobs in industry is very largely a matter of adjustment to modern trends, the annual meeting of the Association of Official Agricultural Chemists affords a definite contribution to progressive industrial activities.

Forms of Nitrogen Used

Striking changes are occurring in the nitrogen content of mixed fertilizers. These changes are taking place both in the amount of nitrogen in mixed fertilizers and in the form of nitrogen and also in the nitrogen carriers.

In Connecticut, for instance, the percentage of organic nitrogen in mixed fertilizers has been decreasing for over 30 years. In contrast with this decrease the percentage of nitrate nitrogen has tended to increase, but the most striking change is in the increase in the percentage of ammonia nitrogen in recent years. This subject is fully discussed in the November issue of "Fertilizer Economics" under the title of "Forms of Nitrogen in Connecticut Fertilizers."

Putting this matter on a definite basis of index numbers, the organic nitrogen has decreased from the index number of 127 for the five-year period, 1896-1900, to 90 in the past five years, 1924-1928. On the other hand, the ammonia nitrogen for the same periods has increased from an index number of 33 to 236, while nitrate nitrogen increased from 61 to 103. It is very interesting to note that for a decade from 1896 to about 1906 the content of nitrate nitrogen in mixed fertilizers was over twice as great as the ammonia nitrogen. In other words, as organic nitrogen declined, for a decade, nitrate nitrogen tended to take its place. But in more recent years, ammonia nitrogen has gone ahead much faster.

These striking changes in the nitrogen content of complete fertilizers are due probably to two chief causes: first, the lower price of inorganic nitrogen, especially in the ammoniate form, and secondly, the new forms of ammonia nitrogen that have come on the market.

If these changes are indicative of the changes that are taking place in the fertilizer tonnage as a whole, then we can assume that lower prices of fertilizer materials will to a certain extent cause an increase in the consumption of such materials, though it is also important to note that while the index number for nitrate nitrogen has been quite low, it has not replaced the organic nitrogen to the same extent as the ammonia has. The changes in the nitrogen situation are, therefore, probably due to changes in prices and a better understanding of the function on different forms of nitrogen in crop production.

Remedies and Diagnoses

The American people are interested in remedies. For real or fancied ills, we spend millions of dollars annually for patent medicines. Many of these may be of no value whatever. Some are of value for specific purposes. These if used for purposes other than what they are designed for, are of no value. Improper usage will give a good remedy a bad name. In this case the trouble is not with the remedy but with the diagnosis.

Agriculture has many valuable remedies proposed for its ills. Few of these are panaceas even though some of their proponents would lead us so to believe. To be specific, during the past few years diversification, cooperative marketing, and farm loans are remedies which have been advised to cure farm ills. These are good remedies under certain conditions, yet too often they have been advised as panaceas and have thereby suffered ill repute. Where they have failed to bring relief, it often has been that the remedy proposed was not what was needed. In other words the failure has been in the diagnosis of the trouble.

As an example the story is told of the earnest young man addressing a group of wheat growers. He advised diversification. This to him meant poultry. Finally an elderly farmer in the front of the hall held up a slip of paper and asked the speaker if he knew what it was. The speaker admitted that he did not. "It's a check for $30,000 which I received for this year's wheat crop," said the farmer. "Wouldn't I look like hell setting a hen?"

Through years of research, remedies for many of the problems of agriculture have been developed. They are remedies for specific situations. If, through failure to properly diagnose the problem, the wrong remedy is used and results are unsatisfactory, it should not cast a cloud on the remedy, yet it does. The present need is not for more remedies, but for better diagnoses. This calls for men who are more interested in solving the problem than in pushing a specific cure.

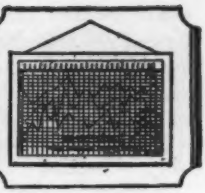
The Fertilizer Situation

The outlook for fertilizer consumption from a national viewpoint continues better than a year ago. The index number of the prices of 12 fertilizer materials is 10 per cent less than in October, 1928. Even though the farm price of cotton in October was 0.6 cents per pound less than a year ago, the prospective yield per acre in practically all of the States east of the Mississippi river is greater than in 1928. The value per acre of cotton in the chief fertilizer States, based on October farm prices, was 6 to 20 per cent greater than a year ago. Records show that an increase in the value per acre of cotton is usually followed by some increase in the fertilizer tonnage. In the potato regions, where an average crop has been obtained, the outlook is better than a year ago. Potato prices are much higher.

Total imports of fertilizer materials during August and September were in smaller volume than in 1928.

But while the present situation for the country as a whole is brighter than at this date a year ago, there are local areas where conditions are not so good—caused by crop disease, damage, and other factors. There is also yet time for changes in crop and fertilizer prices to occur, which may modify the present more favorable outlook.

AGRICULTURAL DEVELOPMENTS



By P. M. Farmer

ACID PEAT EATS TILE

Unless concrete tile is of good quality, it will not stand up against the eroding action of acids found in many peat soils. After five years of tests, D. G. Miller, drainage engineer of the U. S. Department of Agriculture, cooperating with the Minnesota College of Agriculture, found that good concrete was damaged almost not at all, while that of poor quality did not last long. He says farmers can't tell by the price paid whether or not the tile is good. They should send a sample to their agricultural college or experiment station.

TESTS SOIL WITH TIN ROD

Whether a soil is high or low in available phosphorus may now be determined by a simple field test devised by R. H. Bray, an agronomist of the University of Illinois. All that is needed to make the test is a certain chemical solution, a tin rod, and some test tubes or small bottles. The formula for the solution is given in a new bulletin just put out by the College of Agriculture. To make the test one part of soil is shaken up with three parts of the solution in a test tube or small bottle. Only enough shaking is needed to mix the soil and the solution. When the soil has settled out of the liquid, which usually will be in five minutes, the clear solution is stirred gently with the tin rod so as not to roil it. A blue color in the solution indicates available phosphorus, and the stirring must be continued until the color no longer deepens. Soils very low in available phosphorus will produce a light green in the solution, and those high in available phosphorus will produce a deep blue. Shades in between show varying amounts of phosphorus.

With the various field tests for soils now available, it looks as if the county agent or the farmer soon will be able to carry his little satchel of bottles to the field and analyze the skeletons in the soil's subterranean closet.

SPONTANEOUS IGNITION

Apparently bacteria are not the efficient firebugs they were once thought to be. Dr. C. A. Browne of the Bureau of Chemistry and Soils of the U. S. Department of Agriculture says that bacterial action is not responsible for the high temperatures which cause spontaneous ignition of stored products such as hay. Dr. Browne has reviewed the efforts made during the past several hundred years to solve this problem of spontaneous "combustion" and suggests that more work is needed on it. From work done at the department and elsewhere he advances the theory that chemical action following the bacterial action runs up the temperature to the ignition point. The compounds made by the bacteria, he thinks, are oxidized with the result that the bacteria are soon killed off while the temperature continues far beyond this point. In the case of fire from cotton waste soaked with linseed oil, bacteria take no part, Dr. Browne says. Here the unsaturated substance

which readily takes up oxygen is the linseed oil and the entire process leading up to spontaneous ignition is chemical.

VITAMINS GROW ON VINE

Tomatoes that are picked early for shipment to market in colder regions are now commonly colored by means of ethylene gas, also used for coloring lemons, oranges, and bananas. In this way fruits are given a more uniform appearance and of course are more attractive to the buyer, and the treatment makes no change or addition injurious to the consumer. But, says the U. S. Department of Agriculture, tomatoes ripened on the vine are richer in vitamins than those picked early and given the gas treatment. It seems that ethylene is not a vitamin producer even though it brings out the red color and mellows the fruits. Maybe the result will be a greater consumption of canned tomato juice and canned tomatoes.

SEVEN COME A HUNDRED

The Ohio 100-Bushel Corn Club is teaching the corn growers of that State a lot of fundamental facts about the growing of this crop. In 40 counties more than 100 yields of more than 100 bushels to the acre have been produced. After a study of the records of the large number of farmers who have taken part in these contests, E. P. Reed, extension specialist in crops and soils for Ohio State University, says there are at least seven essentials to successful corn growing in that State, and most of them probably will apply just as well in other places where corn is grown. Here are the seven: good seed of an adapted variety; a fertile soil; a well prepared seedbed; proper fertilization; approximately 14,000 plants to the acre on soil well adapted to corn growing; sufficient cultivation to kill weeds and keep the soil in good tilth; sufficient moisture and warm sunshine to keep the corn growing rapidly. And, the way things are going nowadays, we might add an eighth essential—a cultivator with a built-in receiving set.

AN ANTI-VITAMIN

In the world's cereals it seemed for a long time that vitamins were having it all their own way, but now scientists at Sheffield University, England, and at the University of Cape Town, South Africa, call attention to the presence in cereals of "toxamins" and "anti-vitamins." Vitamin D, found in cod liver oil and in other fats, has been considered a cure for rickets, but Dr. Mirvish of the University of Cape Town medical school says it has been shown by recent experiments that the principal cause of rickets is the lowering of the calcium content of the blood. Dr. Mellanby, of Sheffield University, discovered that there are "anti-vitamins" in oats and wheat. The South African scientist found that this substance extracted from oatmeal and injected into the bloodstream of rabbits cut down the calcium content of the blood. It is suggested that rickets may sometimes be caused by too much cereal. We may have to change our notions about vitamin D and possibly some of the others.

BIG STEER WANTED

B. H. Heide, manager of the International Livestock Exposition, Union Stockyards, Chicago, is advertising for a big steer. At the last International a demonstration of the three progressive changes of beef cattle type over the last half century was very popular, and it has been decided to repeat this feature. But it is necessary to have a steer resembling the old-time animal which often wasn't sent to market until it was four or five years old and weighed often much more than a ton. If anyone has a steer that might be made to look like this old-type by November 30, he should write to Mr. Heide at once. No price is mentioned, but those who want rarities do not quibble.

The Province *of* Groningen, Holland

The World's Heaviest Manured Province

By H. Lindeman
Amsterdam, Holland

MOTORING east from Assen, we pass a part of Drenthe and arrive in the province of Groningen, which borders Germany on the east. Having passed the sandy soils, we come into an area of about 80,000 acres which has been reclaimed from peat.

The work of reclamation started near the town of Groningen by the making of a canal on which the peat was to be shipped. Year by year over a long period the main canal and its branches, formed at regular intervals, have been extended until the main canal is almost 50 miles long and the branches several times more. These branches are at right angles to the main canals at intervals of 50 or 100 yards and were first made near the peat area to drain the water off the "flow" moss and moss hags. They now form the line of divisions between small farms.

There is a main road on either side of the canal connected at intervals by drawbridges. Passing along from Groningen the houses gradually become newer and more modern as you approach the peat area of the unreclaimed area. For miles and miles as far on either side as the eye can see, luxuriant crops, principally of potatoes, rye, and oats, strike the spectator's eye. It is difficult to believe that such crops can be grown on land reclaimed from the heath.

A typical picturesque scene in Holland.

The land is prepared in the following way: first of all the peat is cut and from 8 to 10 feet are cast for fuel. About 2 feet of peat, including the surface layer, are put aside and spread on the subsoil, which is composed of fine brown sand. After the peat has been levelled, about four inches of sand dredgings from the canals are spread on top along with two tons of ground limestone per acre.

When broken, at first the peaty subsoil is "quick" and spongy, and to prevent the horse from "bokking" or sinking, pattens or large wooden shoes which protrude about two inches all around the hoof are put on. After the land has consolidated and been ploughed about 10 inches deep, the sand and peat make a soil of fine texture, on which, with suitable manuring, large crops are produced.

The farmers of this district run paper-mills on a cooperative basis. At some of these mills more than 20,000 tons of straw are used annually. There are 10 cooperative paper factories and 18 potato flour factories in Holland. These use enormous quantities of peat, which are on the spot and produce power cheaper than coal.

The farming practised in this area is unique in the respect that practically all of the crops, grown with artificials only, are sold off the farm. Although the system has been carried on for many years, judging by the weight of crop grown, the fertility of the land is as good as can be expected.

The only bulky manure applied to the soil is a small quantity of farmyard manure from a few cows kept for family use and some sows and poultry.

On this great reclaimed area each farm faces the road and canal, which run together, and entrance is had by a neat drawbridge across the canal. The gables of the farmhouses face the road, and as there is a farm every 50 yards or so, you would imagine you were passing along a suburb of a prosperous town with beautiful gardens and trees. The farms here are subdivided by canals every 50 to 100 yards, according to whether there are 50 or 25 acres, and the land runs in long straight stretches behind the buildings. Much of "the carting" to and from the fields is done by small boats on the canals.

The Use of Fertilizers

These peaty soils are of a very poor nature. The surface layer in air-dry condition contains 1 per cent of nitrogen, 0.06 per cent of potash, 0.054 per cent of phosphoric acid, and 0.175 per cent of lime. Only nitrogen is present in rather large quantities. This certainly is the reason why it is unnecessary in the first years to give more nitrogen and still get the large crops.

Formerly only compost of the city of Groningen (capital of the province of that name) was used. Later on compost was imported from other more distant cities. Large rates of compost were given, but they did not contain sufficient potash to produce the highest possible potato yields.

Artificials were used for the first time in

(*Turn to page* 59)

The canals, for which Holland is famous, are utilized for hauling farm produce to market.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Soils, Fertilizers, Economics, Crops, Crop Diseases, and Insects. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

One of the most interesting bulletins of the year on fertilizer experiments with cigar leaf tobacco, is the new Bulletin No. 240 of the Pennsylvania Agricultural Experiment Station, entitled "Results of Tobacco Experiments in Pennsylvania 1922-27." The authors, Otto Olson and D. E. Haley, bring up-to-date and present in a most interesting manner, the results of their work at Ephrata, Pa., and outlying cooperative experiment fields. Of particular interest is their finding that manure alone was not satisfactory. Both yield and quality of plants produced under these conditions have been consistently inferior to those produced by applications of manure supplemented with commercial fertilizers. At the same time, high yield and good quality were obtained when commercial fertilizers alone were used.

Another bulletin of particular interest and value to agricultural workers and farmers in the great cotton belt of the south is Georgia's new Bulletin No. 152, "Cotton Fertilizers and Cultural Methods" by R. P. Bledsoe. A most comprehensive treatment of cotton fertilizers and cultural methods is given. Of particular interest are the results with potash as a top-dressing, applied at chopping time. One year's results indicate that such a treatment pays highest gains where approximately 100 pounds of muriate of potash per acre were applied. The author advises farmers to try potash as a top-dresser on a small scale until more data supporting the practice are available.

Bulletin No. 309 of the Maryland Agricultural Experiment Station gives some very interesting information on "Amounts of Fertilizer and Manure Required for Maintenance of Fertility for Vegetable Production." The authors, T. H. White and V. R. Boswell, emphasize the importance of net returns. While they appreciate the value of manure, the scarcity and high price of manure prompt them to recommend light manure applications, supplemented by commercial fertilizers. The bulletin is timely, comprehensive, and most practical.

"Quarterly Bulletin (Fertilizer Report), Vol. 19, No. 2, January-June, 1929, State Board of Agriculture," Dover, Delaware.

"Compositing Barnyard Manure with Sulphur and Rock Phosphate," Agr. Exp. Sta., Experiment, Ga., Bul. No. 154, July, 1929, W. G. Friedemann.

"Commercial Fertilizers," Agr. Exp. Sta., Lafayette, Ind., Cir. No. 163, May, 1929.

"Sugar Cane Test Fields and Fertilizer Demonstrations," Agr. Exp. Sta., Baton Rouge, La., Louisiana Bul. No. 203, Apr., 1929, C. B. Gonaux.

"Testing Fertilizers for Missouri Farmers; 1928," Agr. Exp. Sta., Columbia, Mo., Bul. No. 270, May, 1929.

"Artificial Manure from Straw," Agr. Exp. Sta., Geneva, N. Y., Bul. No. 573, Aug., 1929, R. C. Collison and H. J. Conn.

Soils

Bulletins discussing soil and field crop management, emphasizing importance of typography, soil type, drainage, cropping systems, and recommended fertilizer practices, should serve to alleviate the ignorance and consequent agricultural distress preva-

lent in many regions. Bulletin No. 482 of the Cornell Agricultural Experiment Station at Ithaca, New York, reflects the trend of thought in this connection and is a valuable contribution. The title of the Bulletin is "Soil and Field-Crop Management for Yates County, New York," and its authors are H. O. Buckman, H. P. Cooper, and F. B. Howe.

Crops

There have been many important and interesting bulletins under this heading coming into circulation this month. One of the two more unusual in the group is the small and attractive four-page leaflet No. 149 of Purdue University on "New and Old Lawns." In very concise form, S. D. Connor, the author, presents general information of interest to every land owner who takes pride in the appearance of the immediate surroundings of his dwelling.

The other publication is the small "Crops and Soil Handbook" for the Red River Valley, which is published by the Northwest School and Experiment Station at Crookston, Minnesota. This publication is pocket-size and the authors, R. S. Dunham, T. M. McCall, and E. R. Clark, have arranged their information for very convenient reference and use.

"Experiments with Alfalfa," Agr. Exp. Sta., Fayetteville, Ark., Bul. 242, June, 1929, Martin Nelson.

"Monthly Bulletin of the Department of Agriculture, State of California," Sacramento, Calif., Vol. XVIII, No. 7, July, 1929.

"High Points in Work of Georgia Experiment Station," Agr. Exp. Sta., Experiment Ga., Bul. 156, June, 1929, C. A. Whittle.

"Quality of Cotton Grown in Georgia," Agr. Exp. Sta., Experiment, Ga., Bul. 157, Sept., 1929, W. T. Fullilove and W. B. Lanham.

"Cotton Fiber Studies," Agr. Exp. Sta., Experiment, Ga., Bul. 158, June, 1929, R. C. Campbell.

"The Cotton Program for Georgia," Agr. Exp. Sta., Extension Division, Athens, Ga., Bul. 364, Vol. XVII, April, 1929, R. R. Childs.

"Onion Culture in Georgia," Agr. Exp. Sta., Extension Division, Athens, Ga., Bul. 367, Vol. XVII, April, 1929, J. C. Morcock, Jr.

"Winter Legumes for Georgia," Agr. Exp. Sta., Athens, Ga., Bul. 374, Vol. XVIII, Aug., 1929, E. D. Alexander.

"Georgia Extension Service Report 1928," Agr. Exp. Sta., Athens, Ga., Bul. 375, Vol. VII, Jan., 1929.

"Agricultural Extension Work in Indiana," Purdue University, Lafayette, Ind., July 1, 1927, to June 30, 1928.

"The Home Vegetable Garden," Agr. Exp. Sta., Ames, Iowa, Cir. No. 115, April, 1929, E. S. Haber.

"Relation of Certain Ear and Kernel Characters of Reid Yellow Dent Corn to Yield," Agr. Exp. Sta., Ames, Iowa, Bul. 257, Jan., 1929, H. D. Hughes and Joe L. Robinson.

"Annual Report for Fiscal Year Ending June 30, 1928," Agr. Exp. Sta., Ames, Iowa.

"More Tomatoes from Fewer Acres," University of Maryland, College Park, Md., Ext. Bul. No. 46, Mch., 1929, L. M. Goodwin.

"Factors Influencing Yield and Quality of Peas—Biophysical and Biochemical Studies," Agr. Exp. Sta., College Park, Md., Bul. No. 306, Mch., 1929, Victor R. Boswell.

"A Study of Spinach Varieties with Special Reference to Their Canning Qualities," Agr. Exp. Sta., College Park, Md., Bul. No. 307, Mch., 1929, Horace B. Farley.

"American Potato Journal," The Potato Association of America, East Lansing, Mich., Vol. VI, No. 9, Sept., 1929.

"Blackberries, Raspberries and Dewberries," University of Missouri, Columbia, Mo., Bul. 265, Jan., 1929, H. G. Swartwout.

"How the Experiment Station Solves Farm Problems," Agr. Exp. Sta., Columbia, Mo., Bul. 272, May, 1929.

"Forty-Second Annual Report of the Agr. Exp. Sta. of Nebraska," Agr. Exp. Sta., Lincoln, Neb., Feb. 1, 1929.

"Premature Seeding of Celery," Agr. Exp. Sta., Ithaca, N. Y., Bul. 480, May, 1929, H. C. Thompson.

"A Study of Some Factors Affecting Seed-Stalk Development in Cabbage," Agr. Exp. Sta., Ithaca, N. Y., Bul. 488, June, 1929, Julian C. Miller.

"North Dakota Potato Grade Inspection Service," Agr. Exp. Sta., Fargo, N. D., Cir. 38, July, 1929, E. M. Gillig, R. C. Hastings.

"Langdon Substation Report for 1927 and 1928," Agr. Exp. Sta., Fargo, N. D., Bul. 228, May, 1929, Victor Sturlaugson.

"Hettinger Substation Report for 1928," Agr. Exp. Sta., Fargo, N. D., Bul. 229, May, 1929, C. H. Plath.

"Horticulture at the Ohio Agricultural Experiment Station," Agr. Exp. Sta., Wooster, Ohio, Special Cir. 23, Aug., 1929.

"The Culture of Greenhouse Chrysanthemums," Agr. Exp. Sta., Wooster, Ohio, Bul. 439, Aug., 1929, W. W. Wiggin.

"Organic Food Reserves in Relation to the Eradication of Canada Thistles," Agr. Exp.

Sta., Wooster, Ohio, Bul. 441, Sept., 1929, F. A. Welton, V. H. Morris, and A. J. Hartzler.

"Further Investigations on the Harvesting, Storing, and Ripening of Pears from Rogue River Valley," Agr. Exp. Sta., Corvallis, Ore., Sta. Bul. 254, Aug., 1929, Henry Hartman, F. C. Reimer, and R. K. Norris.

"The Persistence of Certain Lawn Grasses as Affected by Fertilization and Competition," Agr. Exp. Sta., Kingston, R. I., Bul. 217, July, 1929, E. S. Garner and S. C. Damon.

"Forty-First Annual Report of the Director of the Agricultural Experiment Station," Kingston, R. I., Jan. 15, 1929.

"Work of the Newlands Field Station, Nevada, 1924-1927," U. S. D. A., Washington, D. C., Cir. No. 69, Sept., 1929, E. W. Knight.

"Work of the Huntley Field Station, Montana, in 1925 and 1926," U. S. D. A., Washington, D. C., Cir. No. 70, July, 1929, Dan Hansen, A. E. Seamans, David A. Savage.

"Chemical Injury to Watermelons in Transit," U. S. D. A., Washington, D. C., Cir. No. 74, July, 1929, W. W. Gilbert and F. C. Meier.

"Seed Potatoes and How to Produce Them," U. S. D. A., Washington, D. C., Farmers' Bul. No. 1332, June, 1929, William Stuart.

"Spring-Sown Red Oats," U. S. D. A., Washington, D. C., Farmers' Bul. No. 1583, June, 1929, T. R. Stanton and F. A. Coffman.

"The Production of Johnson Grass for Hay and Pasturage," U. S. D. A., Washington, D. C., Farmers' Bul. No. 1597, July, 1929, H. N. Vinall and M. A. Crosby.

"Influence of Freezing of Seed Potatoes on Viability and Yields," U. S. D. A., Washington, D. C., Technical Bul. No. 119, June, 1929, R. C. Wright and P. M. Lombard.

Bulletin No. 262, Oct., 1929, Dept. of Agr. Immigation of Va., Richmond, Va.

"Some Stock and Scion Observations on Apple Trees," Agr. Exp. Sta., Madison, Wis., Research Bul. 94, June, 1929, R. H. Roberts.

Economics

"Credit Problems of Georgia Cotton Farmers," Agr. Exp. Sta., Experiment, Ga., Bul. 153, June, 1929, Arthur N. Moore, J. K. Giles, R. C. Campbell.

"Types of Farming in Iowa," Agr. Exp. Sta., Ames, Iowa, Bul. No. 256, Jan., 1929, C. L. Holmes.

"The Corn Enterprise in Iowa," Agr. Exp. Sta., Ames, Iowa, Bul. No. 259, Apr., 1929, Edgar B. Hurd.

"The Crop System in Iowa County," Agr. Exp. Sta., Ames, Iowa, Bul. 261, June, 1929, J. A. Hopkins, Jr.

"An Economic Study of Crops and Livestock in the Purchase Region of Kentucky," Agr. Exp. Sta., Lexington, Ky., Research Bul. No. 289, Nov., 1928, J. B. Hutson, W. G. Finn, and Z. L. Galloway.

"Land Valuation II," Agr. Exp. Sta., Columbia, Mo., Bul. No. 269, Mar., 1929.

"The Production and Marketing of New York Market Peas," Agr. Exp. Sta., Ithaca, N. Y., Bul. 475, May, 1929, Dilworth Walker.

"A Study of the Business Practices of Farmers' Local Cooperative Purchasing Associations in Pennsylvania," Agr. Exp. Sta., State College, Pa., Bul. 242, June, 1929, J. K. Stern.

"Farmers' Cooperative Associations in the United States, 1929," U. S. D. A., Washington, D. C., Cir. No. 94, Aug., 1929, Chris L. Christensen.

"The Adjustment of Agricultural Production to Meet Home Market Demands in the Clifton Forge-Covington Trade Area," Agr. Exp. Sta., Blacksburg, Va., Bul. 266, Apr., 1929, J. J. Vernon, T. D. Johnson and Wilbur O'Byrne.

"Cooperative Buying in West Virginia," Agr. Exp. Sta., Morgantown, Va., Bul. 221, Mar., 1929, Paul A. Eke.

Insects

"Heat and Time of Exposure Necessary to Kill Larvae of the European Corn Borer in Ear Corn," U. S. D. A., Washington, D. C., Cir. No. 71, June, 1929, George W. Barber.

Diseases

"The Control of Root-Knot in Seedbeds," Agr. Exp. Sta., Gainesville, Fla., Press Bul. No. 416, Sept., 1929, J. R. Watson.

The Value of Stalks

(*From page* 19)

small seeded crops as the clovers, alfalfa, and the grasses, where a well-worked and compact seedbed is so much to be desired, are all factors that must be considered in arriving at their actual value. And when the European corn-borer, now just around the corner, comes to live with us, what then? I shall leave that for you to answer.

"Judging from my own experiences as a farmer," said Mr. Plager, "and from other farmers in Grundy county who have had experience in taking off corn-stalks for several years, I will say that there is about 45 cents' worth

of value in each ton of stalks. This year where the stalks were taken off, farmers, without exception, had a better yield of oats than others who left the stalks on the field. We have one farmer, Ike Hasbruch, of Grundy Center, who has increased both his oats and his corn yields 15 bushels per acre by removing the stalks. Of course, he grew clover every time he seeded small grain. He does not credit, entirely, the increased yield to taking off the stalks, but indirectly part of the increase is due to better seeding of the oats and clover and to the better working of the seedbed. The rest he attributes to the clover."

Over a term of years, corn-stalks have a definite fertilizer value when turned under, but that value is by no means as great as a chemical analysis, on a fertilizer basis, would seem to indicate. Both from the economic and the fertility standpoint, we have reached the time in the expansion of agricultural products to other uses when we must consider their value in relationship to other products, and we must find out in just what form they are most economically disposed of in the markets of the world. Herein lies one solution for the disposal of our by-products, our troublesome, price-depressing surplus, and our agricultural wastes.

Our Federal Department of Agriculture and the various States are now at work trying to determine the value of the corn-stalk. But we know now that the nitrogen and humus replacing value of our newer legumes, alfalfa, sweet clover, and soybeans, will be important and cheap sources of the free nitrogen of the air. When we come to phosphorus and potassium, we must consider their replacement value in a commercial form—eventually we will, for there is no other method of replacement.

The lowly corn-stalk is dressing up for polite society. Already 184 products are made from it. In addition to those already credited to the stalk, we might mention such others as face powder, corn syrup, gun powder, papier-mache, and breakfast food—all are articles for which there is a demand. Advancing industry, in new ways, is bidding for our products. Shall we consider this opportunity, or refuse the bid? There are possibilities here for agriculture—perhaps beyond our fondest hopes.

The Care of Orchards

(*From page* 24)

permanency of wire wrappers and the saving of labor in wrapping and unwrapping each year makes them the cheapest in the long run. Protection to the tree trunks is also afforded all the year round. This is important because rabbits may do injury even in the summer time. Wire wrappers should be removed as soon as they begin to bind, otherwise they may girdle the trees and kill them.

When the apple trees reach an age of from 8 to 10 years, they are not likely to be seriously injured by rabbits. The same holds true with other fruit trees such as peaches, cherries, and plums. To minimize the liability of injury, however, the grower should continue to keep wrapped the trees which may grow near fence rows, ravines, or other quarters of the rabbit.

For the parts of the bearing orchard located more distant from the haunts frequented by the common cottontail rabbits, serious injury may often be prevented by commencing the regular pruning work shortly after the leaves begin to drop in the fall, leaving on the ground near the trees the branches removed. These furnish food for both rabbits and field mice, and they may be fonder of the tender bark on the pruned branches and shoots than that on the tree trunks. As a result, the rabbits and mice do little injury to trees eight or more years old.

Potash for Cotton Diseases

The idea of potash correcting the effects of rust in cotton is not a new one, and not confined alone to investigations in the United States. As far back as 1924, we find published in a book "Cotton in South Africa," page 183, by W. H. Scherffius and J. duP. Oosthuizen, the following:

"Black Rust"

"Yellow Leaf Blight; Potash Hunger—Plants affected by this disease are stunted and chlorotic. The leaves first become sickly yellowish, then they assume a reddish brown color and finally curl up and drop off. Rust usually occurs in definite spots or irregular areas but is not caused by any disease-producing organism. It is associated with unfavorable soil conditions and usually breaks out in crops planted on badly drained, sandy soils that are lacking in both humus and potash.

"Control of this trouble lies in improving the soil conditions. This may be effected (1) by practising a good crop rotation, (2) by plowing under green-manure crops so as to provide the necessary humus, and (3) by the application of from 50 to 100 pounds of muriate of potash to the acre."

A Potato Experience

By M. V. Bailey

Soils Department, Ohio State University

MR. WM. CLARK, Rutland, Meigs county, Ohio, has learned by experience that money spent for high-grade fertilizers for potatoes is an excellent investment. Late in March, 1929, on a mineral soil, he planted Irish Cobblers and used different amounts of a 6-8-6 fertilizer to compare with no fertilizer. A clover sod, manured at rate of 8 tons to the acre, had been plowed down. All the fertilizer was applied in the row.

The potatoes were harvested August 25, and the following yields secured:

No fertilizer	120 bushels
400 lbs. 6-8-6	140 "
800 lbs. 6-8-6	280 "

"The season was unfavorable as we had three or four days with the temperature above 90 degrees. The yield on the fertilized plots was greatly reduced by hot weather and lack of rain," reported Mr. Clark.

In Mr. Clark's community a 6-8-6 fertilizer cost about $2.35 per hundred pounds. For the 800-pound application this meant a cash expense of about $18.80. The increase resulting from it was 160 bushels of potatoes.

REVIEW OF THE POTASH EXPERIMENTS CONDUCTED IN BAVARIA IN THE YEARS, 1919-1925, BY F. FURST

"Ernaehrung der Pflanze", 23 *No.* 1, 1927

Abstracted by Kleeberger, Giessen, in "Zeitschrift fur Pflanzenernahrung Dungung und Bodenkunde" B, 1929, *No.* 1, *p.* 48.

The average of 624 potash experiments gave an increase in yield of 17.11%.

1 kg of potash (K_2O) gave an increase of 3.62 kg of rye, 4.67 kg of wheat, 4.33 kg of barley,

3.30 kg of oats, 24.72 kg of potatoes, 73.59 kg of mangels, and 10.45 kg hay.

24.04% of the experiments showed little or no response to potash; 26.06 responded medium and on 49.36% of the soils a very decided potash deficiency was noted.

Thus approximately 76% of the experiments showed the need for potash.

Potash Starvation of Potatoes

(*From page 29*)

800	"	"	"	2-8-16	1,500	"	"	"	4-8-6
1,500	"	"	"	5-10-5	500	"	"	"	4-24-12
1,000	"	"	"	4-16-4	500	"	"	"	4-24-12
1,500	"	"	"	5-13-8	1,000	"	"	"	4-12½-5
1,500	"	"	"	5-13-8	1,000	"	"	"	4-12½-5
800	"	"	"	4-16-8	1,360	"	"	"	5-14-4½
800	"	"	"	3-8-10	1,400	"	"	"	3-14-7½
1,000	"	"	"	2-16-6	300	"	"	"	15-30-15
800	"	"	"	2-12-6	850	"	"	"	3½-18-11½
800	"	"	"	2-12-6					
800	"	"	"	2-12-6					
800	"	"	"	2-12-6					
700	"	"	"	2-12-6					
1,000	"	"	"	4-10-6					
900	"	"	"	5-13-5					
1,000	"	"	"	3-8-6					
900	"	"	"	3-8-6					

One man used no fertilizer.

In many instances these men have arrived at the analyses they are now using through the trial method. A composite of all their formulas would be a 3.7-13-7.4 applied in the row at the rate of 900 pounds per acre.

Potash in Evangeline Parish

(*From page 21*)

immature bolls. It was an odd sight to see a field of cotton streaked in such a manner. This field was located on the main highway leading by the high school and community store where there was much traveling, particularly of local farmers and business men. Immediately they would inquire the cause of this unusual cotton field. It became the principal topic of interest wherever a group of farmers were gathered.

Needless to say, the tenant was very much pleased with the results, as he harvested five bales from the 11 acres where he had previously been harvesting two to three bales. He and many of his neighbors immediately placed their order for a supply of muriate of potash for the following crop. The second year he applied potash to his entire crop, not leaving any check rows, and produced on the same 11 acres eight bales of cotton. The third year he produced 10 bales. He has had no trouble with rust since, and the old run-down farm which was considered a place only to starve a farmer and his family is today one of the best farms of the community.

Since the introduction of potash into this territory a new problem arose, not how to get farmers to use potash but how to keep them from using too much. The farmers generally used 100-200 pounds of 16 per cent superphosphate per acre in fertilizing cotton. To this they would add 100 pounds of muriate of potash, giving an unbalanced fertilizer. However, the soil was so deficient in available potash that the above mixtures

gave good results, and that was what the farmer was concerned with.

In 1924 an evening school for adult farmers was organized at the Vidrine High School, also one at the Mamou High School in an adjoining community, which about 150 farmers attended. A practical course in fertilizers was offered where the functions of the plant food elements of which our soil is likely to be deficient were explained, also the sources of these plant food elements, and the form in which the plant can take them up. Each farmer who enrolled was required to conduct a cotton project and fertilize according to recommendations of the instructor. At the conclusion of this course in the fall, when the results of these projects were obtained, a general meeting of the two classes was held and these results were discussed. This discussion resulted in the farmers using 300-500 pound of a complete fertilizer of which a 4-10-7 (N-P-K) analysis is mostly used.

The county agent, Mr. T. H. Vidrine, gave his full cooperation in this work and extended it to other communities of the parish.

It would be a mere guess to attempt to estimate in dollars and cents the value potash has been to the farmers of this parish and the public in general. Since its introduction the farmers have learned to fertilize intelligently, the rust problem has been solved, and a considerable increase in yield per acre of cotton and other crops is realized. The farmers are more progressive and willing to consider new practices in farming, as the use of good seed, fertilization, cultivation, and crop rotation.

More than 300 tons of muriate of potash and 2,000 tons of 4-10-7 fertilizer were used in this parish this year, not considering the quantity of fertilizer of other analysis that was used.

Vermont

(*From page 26*)

problems in comparison with her nearby sisters; why studies of dairy feeding and management, the utilization of dairy products and by-products, of the maple sap flow and of the economics of this unique industry, of the business side of dairy farming, of forestry problems, and the like have been stressed; and why her contribution to this special series of articles may seem less striking than those furnished from most other states. Yet Vermont, a land where the dairy cow, and therefore meadows and pastures, is the backbone of existence, has an increasing interest in soil productivity. It may be noted in addition to what already has been noted that—

(1) A somewhat superficial survey of the soils of the state, covering some thousands of samples, indicates that in the great majority of cases organic matter is relatively plentiful in the soil, that nitrogen and potash are fairly plentiful, and that phosphoric acid, speaking broadly, is more likely to be lacking than other plant food.

(2) A reconnaissance soil survey of the entire state is under way under the auspices of the United States Bureau of Chemistry and Soils, the Vermont Comprehensive Rural Survey and the Experiment Station. It is expected that the field work will be completed in the fall of 1930 and the results made available at some later date.

(3) Pasture feeding is a vital factor. A 64-page station bulletin now in press, dealing with the yields and composition of unfertilized pasture grasses on many pastures, good, poor, and very poor, furnishes food for thought as well as food for animals.

Dr. Ernest Van Alstine, Professor of Agronomy of the University, has for years conducted demonstration trials all over Vermont on meadow

lands and pastures. Ground limestone has very generally worked well on hay lands. The average acre gain on 70 farms following its application was approximately a half ton of hay. On 13 of these 70 where observation was continued, the same half-ton gain appeared for at least three years. On only 9 of the 70 was no gain whatsoever secured. Superphosphate, 200 to 600 pounds per acre, in the several cases in which trials were made, usually resulted in increased hay yields, averaging five-eights of a ton per acre.

The results of some of Dr. Van Alstine's pasture fertilization trials carried on in Vermont's island county recently have been published. "Nitrophoska" (15/30/15) was used in early May as a top-dressing on about 6 2/3 acres at the rate of 284 pounds per acre, followed in early and late June with 45½ pounds Calurea (34 per cent nitrogen) and in early September with another 75-pound application. The fertilized area and an adjacent area of similar size and quality of original herbage were pastured at alternate periods throughout the summer.

"Milk production for the days when the fertilized field was being pastured amounted to 3.8 times as much as it did while the unfertilized field was being pastured. This was the case in spite of the fact that 50 per cent of the pasture days and 59 per cent of the milk produced from the unfertilized field came in the spring, nearer the beginning of the lactation period, while only 39 per cent of the pasture days and 50 per cent of the milk produced on fertilized pasture came during this period.

"During the spring period the fertilized field had a little less than three times the carrying capacity of the unfertilized field, while during the summer period, the short grass period, the fertilized field had five times the carrying capacity of the unfertilized field. During the fall period, fertilizer increased the pasture feed to about 4½ times what was produced without fertilizer. In other words, fertilizing benefited the pasture during the summer and fall when benefit is most needed relatively more than it did during the spring."

Ice Wells

(*Continued from page* 30)

14 days during July, the hottest part of the summer. The temperature in the pit an inch above the ice varied from 32 to 42 degrees. Six inches above the ice it varied from 44 to 50 degrees, and a foot above, the temperature was never higher than 50 degrees Fahrenheit.

Meat, fruit and vegetables as well as milk and cream were stored in the pit and kept perfectly. No offensive odors were detected at any time during the summer in the well or in the stored products. These results obtained at Mandan represent only one season's trial and the work will be continued with some variations.

Points suggested for consideration in building an ice well are the selection of a well-drained site and provision of proper drainage so the ice water can run away from the bottom of the pit. The pit should be located as near the milk house as possible and near the well for water supply. The floor of the house should be tight so the air circulation can be reduced to a minimum during summer months. The cost of an ice well will vary with conditions, but by using home labor and the cheaper grades of lumber the cost will be very small.

Additional information regarding the ice well can be obtained from the U. S. dairy field station, Mandan, the North Dakota Agricultural College, Fargo, or the U. S. Department of Agriculture, Washington, D. C.

Fertilizers for Sweets

(*From page 9*)

word of caution is added that different results may obtain in a dry season.

Zimmerly (1929) worked with various fertilizer combinations on sassafras sandy loam in a rotation of Irish potatoes, sweet potatoes, and corn with cover crops. Fertilizers were applied at the rate of 2,000 lbs., 1,000 lbs., and 500 lbs. respectively to each crop.

II. Zimmerly—Average Yield of Prime Sweet Potatoes 1920-28

Treatment	Bushels per acre
3-3-15	289
6-3-12	283
3-6-12	268
6-6-9	259
9-6-6	253
3-9-9	246
6-9-6	241
3-12-6	237
12-3-6	236
9-9-3	232
15-3-3	206
15-6-3	204
3-15-3	197

The average yield of primes for nine years 1920-28 are given in the accompanying table II.

Zimmerly says, speaking of the 1,000 lb. application of 3-3-15, "A higher ammonia content, as a 4-3-15 or a 6-3-15 mixture, may be advisable for soils deficient in nitrogen. The 3-3-15 combination is similar to the 2-8-10 mixture commonly used, with the exception of the phosphoric acid content. If we multiply the 3-3-15 mixture by 2/3, we will get a 2-2-10 formula. It will be necessary to use a 2-2-10 or a 2-8-10 at the rate of 1,500 lbs. per acre to furnish the same amount of ammonia and potash as is carried in 1,000 lbs. of a 3-3-15 goods or 750 lbs. of a 4-4-20 formula. The use of the last formula is recommended from the standpoint of economy."

From pine shats to high analyses in 40 years is the story of progress in sweet potato fertilization.

Man-made Forests

(*From page 6*)

ada to keep the mills in operation.

Some forestry experts have predicted the end of available timber within the next decade. However, when the swish of the last mighty pine falling down the hillside where forests once reached into the skies vanishes, "man-made" trees will be ready to replace those that nature provided for the Nekoosa mills.

Not unlike the other natural resources of the country, for instance farm animals which satisfy the needs of the human race, foresters say the "primeval forest" must be domesticated if it is to withstand the blows of man's axes.

So the commercial interests in the Nekoosa-Edwards region have answered the call to replace virgin forests that have for years furnished log after log to the hungry mills. And, not unlike the early livestock breeders who developed animals to suit human needs, not unlike conservationists who have established protection for the buffalo and other animals nearing extinction, the managers of paper mills are meeting the danger of having their forests become extinct by building forests for themselves.

And in building these "man-made"

Mighty brush plows like this are used to plow the furrows in which the seedlings are planted. This plow, designed by agricultural engineers at the University of Wisconsin, is capable of plowing furrows through brush up to 10 feet in height.

forests, ways are rapidly being devised to help nature do her work in less time.

These methods and conveniences were demonstrated at the field day held in the paper milling region. Many types of machinery were shown, from a plow devised by agricultural engineers at the University of Wisconsin, which plows furrows through brush up to 10 feet in height, to a fire truck for extinguishing a forest fire purposely started so the equipment could be demonstrated in action.

With the aid of all these conveniences, the foresters expect to maintain a forest which will supply the mills during the coming centuries. They plan, by selective cutting, to make the forests permanent once they are established in sufficient size.

The project calls for the planting of 2,000 acres or about 2,500,000 trees annually for 35 years. Think of it! Seventy thousand acres of jack pine, spruce, and other pulp wood trees to furnish an endless supply of pulp to the paper mills!

Besides producing valuable timber, the present barren areas of abandoned farm lands situated near the edge of Wisconsin's "sand belt" will be beautified by the trees. Instead of bare unproductive fields to greet the tourist in his search for beauty, forests will furnish everlasting beauty. But when admiring tourists drive by the plantings, even then the subject of their delight will be furnishing and ready to furnish increasing amounts of the products they demand in paper for books, magazines, newspapers, and hundreds of other modern conveniences.

How Businesslike Should a Farmer Be?

(*From page* 14)

Improvement in these and other respects followed. The most recent returns indicate that substantial benefits have been derived. On all these farms the percentage of legumes, the amount of beef sold, and the average receipts per hen showed a gain in 1927 compared with the year before the accounting work began.

Farm bookkeeping has many sub-

stantial triumphs to its credit. One county agent who induced 41 farmers to keep accounts systematically for several years reports that as a result of this work an area formerly devoted almost exclusively to cash crops is turning rapidly to a diversified form of agriculture. The aggregate net income of these 41 farmers has been much increased.

Farm accounting has had a great boost in Illinois. In one county in that State a group of farmers who kept accounts for a number of years last year reported an income averaging about $1,000 more than the average on similar farms in the same district where no accounts were kept. This object-lesson in the value of farm bookkeeping was made widely known, with the result that farm accounting suddenly became very popular.

In a locality where most of the farmers are rather recent converts to the practice of keeping accounts, a number recently asked what benefit they got out of it. One said the first year's figures showed him how to decrease his hired labor expenses by about $200, and to cut out many unprofitable practices. This man increased his annual labor income from $387 to $2,227 within a comparatively short term of years. Another man in the same group reported that keeping accounts showed him he had been paying $1.07 for feed yielding only $1 in returns. A third farmer said his accounts showed him how, without investing a cent in additional equipment, he could raise from $300 to $500 worth of corn that he had been accustomed to buy each year.

Thousands of American farmers have gone a step further and adopted a budget system by which their farm business can be planned in advance on the basis of an estimate of probable receipts and expenditures. This system makes outlook reports on market prospects much more useful, since it permits a reasoned judgment as to the prospects for the individual farm.

Another indication that our farmers are waking up to the significance of business considerations in their work is their increased demand for crop and market news. More than 5,000,000 mimeographed reports on livestock alone were distributed by the U. S. Department of Agriculture last year, though every effort was made to keep the mailing lists down. The department's leased wire service for the transmission of market news now brings timely crop and market information to the farmers of 26 States.

How Much Bookkeeping?

In attempting to judge the business efficiency of farmers it is quite inappropriate to compare their methods with those used in other occupations. Methods suited to industrial concerns may be quite unsuited to agriculture. The real test is the suitability of the means employed to the ends desired. Farmers can afford to spend some time regularly in keeping accounts. They can not afford, however, to do this work as minutely as it is usually done in business. Bookkeeping that shows the farmer where he stands and indicates how he may alter his work to make it yield him a better return is essentially all that he requires. If he attempts too complicated a system and accumulates a multiplicity of unnecessary details, he will waste much time, and possibly throw up the entire undertaking in disgust.

In recent years American farmers have probably made more progress in the collective than in the individual use of business technique. Producer-owned and controlled cooperative marketing associations have attained a very high degree of business efficiency, as is proved by their financial results and also by the testimony of competent observers. Cooperative units have become larger and a start has been made in the coordination of sales among different cooperative associations. More than 200 farmer-owned cooperative associations now each transact an annual business exceeding $1,000,000. Such a development puts

agriculture distinctly in the big business field. It necessarily calls for strict accounting, economic handling of products, and successful merchandising. It should not be many years before the business organizations of agriculture stand fully on a par with those of industry and trade. It is coming to be recognized that good business in agriculture necessitates the application of business mthods in the planning as well as in the actual conduct of production so that marketing programs will not be frustrated by burdensome surpluses.

In all probability the business education of agriculture is going forward as rapidly as can be expected and as comprehensively as the circumstances require. Many of the principles involved have not yet been determined. Economists freely acknowledge, for example, that efforts to forecast market prices on the basis of supply and demand information are as yet only partly successful. It is not possible to advise farmers with confidence just how much they should increase or decrease their acreage or livestock breeding. Farmers who should assume that everything is cut and dried and should plan their operations on the false assumption that supply and demand can be calculated as accurately in agriculture as it can be calculated in other industries would make a very hazardous mistake.

There is much in the conduct of the farm business that must be left to the judgment and intuition of the experienced farmer, since it can not be completely revealed by the most thorough-going accounting. In making haste slowly in this matter of applying business technique to agricultural practice, the farmers may disappoint certain enthusiasts; but the chances are that their policy is well advised. It is still the chief business of the farmer to produce efficiently. He can find out more to-day as to *what* he should produce than was possible heretofore. But in this field experience is at least as reliable a guide as a hasty analysis of prospective market changes. Each year sees a stronger tendency on the part of the farmers to plan their work in the light of economic information and on the basis of results disclosed by cost studies. They are probably moving as fast in this direction as they should move.

Dry Peas

(*From page* 15)

forage and a considerable amount is also used as a soiling crop.

The cow-pea is related to the bean family rather than to the true peas. It is a very old crop, a native of southwestern Asia where it is important as a human food. In America, however, it is grown only as a stock feed, being used both in the seed and forage forms. It makes an excellent green manure crop and much of the acreage is used for this purpose. The true seed belt corresponds closely with the older United States cotton belt.

The field pea is essentially a northern crop. This is the true pea family and includes many varieties. The seed of the field pea is mostly grown in Wisconsin and Michigan and to a lesser extent in adjoining States. Some production is also found in the western States, particularly Colorado. Climatically, the field pea seems to prefer the same region as the potato, though it thrives best on the heavier soils. This crop is used both for human food and for stock feeding. The dry peas used for human food are mostly the various varieties of soup peas which are also grown extensively in foreign

countries. In Wisconsin, the leading soup pea State, large acreages of Green and Scotch field peas are grown. These are especially well suited for the use of splitters who prepare soup peas. The Canada field peas so commonly used for forage and seed are yellow colored. In recent years the soup pea industry has been somewhat depressed due to foreign competition.

The canning pea is probably an offshoot of the field pea and there are many varieties. Most of the canning types are rough skinned, that is, pitted or wrinkled, and the production of canning pea seed is an important industry in the western States, the leading producers being Idaho, Washington, Montana, and Colorado. Some canning pea seed is also grown in central and eastern States. In addition to the production of canning pea seed, the western region also produces much pea seed of the garden varieties which are becoming increasingly important. California also has an important dry pea production, but it is quite varied as to types.

The canning and garden peas are mostly harvested green and the commercial acreages are largely grown in the more humid parts of the United States, Wisconsin and New York leading. Wisconsin usually packs upwards of half of the United States' canned pea production, but most of the seed for this production is grown in the drier western states where yields are higher, diseases less troublesome, and harvesting weather more favorable. Certain canning pea seeds, especially the early or Alaska varieties, when not used for the growing of green peas or seed, are frequently used by splitters as soup peas. The late or wrinkled varieties are not suitable for this purpose.

The map shown herewith shows three prominent dry pea areas. The southeastern or cow-pea area, which represents essentially the cotton belt, produces peas almost entirely for stock feed. The Wisconsin-Michigan area produces largely field peas which are used as seed for forage crops and as peas for soup, and some canning pea seed. The western section from Colorado to Washington produces mostly canning and garden pea seed, though in some States like Colorado and California, a considerable variety of types is grown.

World data on dry pea production are not especially satisfactory, the only available material dating back to prewar times. At that time, however, Russia was the leading producer followed by the United States and Spain. Together, these three countries produced over three-fourths of the world's output. It is of interest to note that the foreign pea production is almost entirely of the field or soup pea types, and much of it is used as human food. This accounts for the foreign competition which has been felt so keenly in recent years by American producers of soup peas. The production of canning peas in foreign countries, outside of Canada, is quite unimportant, this being almost entirely an American industry.

What's Ahead

(*From page* 12)

tically stationary for the entire 40-year period; and in Missouri, on a considerably expanded wheat area, yields have been practically stationary. The statistics of yield per acre indicate that the southern part of the Corn Belt, as represented by Missouri and eastern Kansas, have lagged behind the northern portion, as represented by Iowa and Illinois, in the development of

agricultural practices and soil-management methods that tended to raise the acre yields of the important crops.

Europe's Progress

In western Europe, there has been an enormous increase in productivity during the last 150 years, largely on account of increase in crop yields. Wheat yields per acre rose gradually from a level ranging between 6 and 10 bushels per acre in the various countries to a level of 20 bushels per acre in France and over 32 bushels per acre in England and Germany. In the smaller countries such as Denmark, even higher acre-yields have been obtained.

For many years preceding the American Civil War, the increasing demand for food to supply the needs of the growing European population resulted in rising prices that made possible the development of intensive types of agriculture in northwestern Europe. Under the common field system on the continent the soils had long before the end of the medieval era lost their power to produce more than 6 or 8 bushels of wheat per acre, but from the later half of the eighteenth to the middle of the nineteenth centuries the methods and practices used in the times of the Romans were re-adopted. The introduction of root crops and clovers from Flanders, the development of crop rotations, the increase in numbers of livestock, and the increasing and more efficient use of animal manures raised crop yields in England to 20 bushels per acre.

Wheat yields in Germany rose from 10 bushels per acre in the closing years of the eighteenth century to about 16 bushels by the middle of the nineteenth century. In France, wheat yields increased from an average of about 12 bushels per acre during the decade following the Napoleonic wars to about 16 bushels per acre by the middle of the century. Following the depression of the Napoleonic wars there was a steadily growing demand for food products as a result of the rapidly increasing urban population in England, and crop yields began to rise until by the late eighties wheat yields had risen to a fraction of a bushel less than 30 bushels per acre.

Cheap grains from the United States, following the Civil War, acted as a check upon both acreage expansion and efforts to increase yields in Europe but the figures for the last 40 or 50 years show a continued rising trend in crop yields. Whereas the average yield of wheat in England and Wales in 1884, for example, was 29.9 bushels per acre, the average yield in 1928 was about 34 bushels per acre. The average wheat yield in France in 1878 was 15.5 bushels per acre, but now it is nearly 22 bushels per acre. In Denmark the average yield of wheat in 1878 was 35 bushels per acre, but in 1928 it was 48 bushels per acre, a peak of 57 bushels per acre having been reached in 1911. In Germany the average yield in 1878 was 21 bushels per acre but in 1928 it was 34 bushels per acre. These increased yields are reported to be the result of widespread adoption of improved scientific methods in recent years and the increasing use of commercial fertilizers.

The Manless Farm

The so-called agricultural depression of the post-war period having ceased to be news, the press is now filled on the one hand with opinions of the great era of prosperity upon which agriculture is about to enter, and on the other with calculations of the deplorable state in which agriculture will find itself within the next few decades. The view is expressed, for example, that the population of the United States will become stationary within 30, 50, or 75 years—the latest opinion is that we will reach this state about the year 1960 with a total popu-

lation of 150,000,000 people—and that production can be increased with such great ease that we will always have a surplus problem with consequent low prices and an agriculture that will always be in the dumps.

The optimist, to the contrary, sees a condition when the problem will be to increase production, whereas now it is to hold down production. Agriculture will have expanded to its territorial limits, says he, and if the larger population of two and more decades hence is to be fed, emphasis must once more be placed upon intensity of production—of growing the proverbial two blades. Per acre costs under these conditions will mount high, but with the use of even more efficient machinery than we now know, and the use of intensive cultivation practices, we will have low unit cost of production on the highest priced land in the world. Farm land values then will make the war-time values look like "thirty cents."

The American farmer of 50 years from now, says he, will sit in an office before an electric switchboard and control automatic plows, cultivators, and harvesters which will produce his crops without the aid of a single field laborer. Automatic farm machinery which runs without constant human supervision will be used widely. Field markers will be located so that all machines necessary for field operations will be guided by long arms attached to these monuments.

The manless machines will be able to work all night if necessary, thereby doing the work of two or three man-driven machines. Their forerunner, which has already proved successful, is a manless plow in use at Iowa State College which, after being steered across the field to make the first furrow, guides itself automatically by a guide wheel which follows the last furrow plowed until the field is completed.

Farm engineers now, he continues, are developing a soil-tilling machine which will so pulverize the soil, organic material, and plant food as to make their full richness available the same year instead of consuming two or three years. A feed-grinder starts automatically at a certain time, is fed automatically, and stops when the grain runs out. It is operated at night by electricity when the power rate is cheap.

Meanwhile, there is the practice and not the theory, of the man on the farm. Regardless of whether the population is going to continue to increase or stop at a given point, his job year after year, as he sees it, is to grow the biggest possible crop at the lowest possible cost. Examine the record of every successful farmer and you will invariably find low unit cost of production. His total operating expenses may be enormous, but when they are reduced to per unit cost, they show a profit even in the worst years of the agricultural depression.

Wouldn't it be fun to run a manless farm?

Holland

(*From page* 44)

1880. They caused a fight but at last artificials won.

Already in the first years after 1900 artificials only were used. Compost was no longer applied and the stables, originally built for a big number of cows, remained empty and the *colonial agriculture without cattle and with the use of artificial manuring only* started.

After preliminary drying, the peat blocks are stacked in neat piles for further drying.

The first year 267-312 pounds of K_2O (patentkali* or potash manure salt 40 per cent), 152-178 pounds of P_2O_5 (basic slag), and 134 pounds of N. (nitrate of soda or nitrate of lime) per acre are applied for the growing of potatoes. Furthermore, 890-1800 pounds of lime (shell-lime) are used.

In the second year potatoes are grown again and the same manuring but without lime, is supplied. The first year farmers raise 520 bushels of potatoes or more per acre. Such a crop contains 308 pounds of K_2O, 60 pounds of P_2O_5, and 140 pounds of N., so that there is a good balance with the quantities of manure supplied.

In the third year rye or oats are grown in which clover is sown.

Later on potatoes and rye or oats are grown alternately. Sometimes people raise two crops of potatoes in succession and then oats, or horse-beans, or beets.

When the soil has been cultivated for a number of years, the quantities of fertilizers are lowered a little. Cereals get less than indicated for potatoes, that is to say two-thirds of the quantities for potatoes.

Still the quantities supplied for potatoes on soils that are under cultivation for 50 years are about 180 pounds of K_2O, 90 pounds of P_2O_5, and 90 pounds of N. per acre.

The use of lime is not regular; some people think that sufficient lime is supplied with the other fertilizers (artificials); other people, for instance, apply 710 pounds of shell-lime per acre every four or five years.

*Patentkali-sulphate of potash magnesia.

Without doubt there is no country in the world that uses so many artificials as Holland. On an average there was used during the last years per acre of the arable soil in the form of artificial manure:

36 pounds per acre of K_2O
36 pounds per acre of P_2O_5
18 pounds per acre of N.

Holland has 5,604,694 acres arable area of which 3,143,675 acres are in pasture and meadows, 2,199,996 are under the plough, and 261,022 acres are used for horticultural purposes. Moreover it is to be considered that Holland has the following stock of cattle: horses, 363,668; cows, 2,062,771; sheep, 668,211; pigs, 1,519,245; fowls, 9,660,799, so that there is a very large production of manure.

The average yields in Holland are, per acre:

542 bus. of potatoes for industry-purposes
238 bus. of potatoes for consumption
14.27 tons of sugar beets
38.51 bus. of wheat
50.19 bus. of barley
31.8 bus. of rye
59.6 bus. of oats.

On an average the Holland farmer spends $12 on fertilizer per acre; in the peat-settlements the use of artificials is so intensive that $60 worth of fertilizer is used per acre.

On Other Soils

In connection with the great number of cattle in Holland a big quantity of manure is produced. In other parts, as, for instance, in the peat-colonies (veenkolonien), and in some horticultural centers, fertilizers are used exclusively. The potash is used on all sandy and peaty soils in Holland.

On the clay soils the practice of using potash has developed only within

the last years. Before that people had thought that the use of potash on these soils was not necessary because they were rich in potash. The results showed, however, that in consequence of the intensive culture, of the increase of the cultivation of beets and potatoes, of the increased use of nitrogen many clay soils responded readily to the use of potash. In consequence of the rather humid climate of Holland considerable quantities of both lime and potash are leached out of these soils and so people generally suppose that soils containing little lime also contain very little potash. On the new clay *polders** one can cultivate for a number of years without the use of potash. The longer the soil is under cultivation and the more it is handled intensively, the sooner the use of potash will be necessary. A very important factor is the origin of the clay soils. Sea clay soils are able to supply soluble potash for a greater length of time than river clay, and the river clay formed by the Rhine contains more potash than that from the Maas.

During the last 10 years people have discovered clay soils in different parts of Holland which, in experiments, proved to be very responsive to potash. These parts include different old sea clay polders in the provinces of Groningen, Friesland, North Holland, South Holland, North Brabant and Zeeland; but to a larger degree, they were the river clay polders along the great rivers, especially along the Maas in the provinces of Gelderland and South Holland. Some soils contained so little potash that different crops showed distinct signs of potash starvation.

A very interesting region in this respect is the Bommelerwaard situated between the rivers Maas and Waal which consists of river clay. In this case, the experiments were started seven years ago and potash is now generally used in consequence of the splendid results obtained. Under the supervision of Mr. H. Lindeman, Director of the N. V. Vereenigde Kalimaatschappij, more than 200 experiments have been carried on in this rather small district. During the last few years there have been added hereto the well-known central experimental fields for potash in Hedel and Ammerzoden. The soil at Hedel contains in average 30 per cent clay and at Ammerzoden, the clay runs as high as 50 per cent.

* A polder is land that has been reclaimed from the sea.

The peat is cut into blocks and dried for fuel. This is a scene at Valchemont, Holland.

In spite of this fact, the crops grown on these soils show marked increases in yield when potash is applied, and show distinct signs of potash deficiency when no potash is given.

The results on these experimental fields have had a great influence on the use of potash in Holland, especially since the liberal use of potash prevents the turning blue of potatoes.

Frost Warnings

(*From page* 4)

blank of climatic perfection, except for a few shakes and showers.

There are no professional rememberers out in the bonny belt. This is simply because they are all organized to acclaim that it never could be any nicer and under no circumstances any worse. Here we are optimists with the creed that the worst has passed and the best is yet to come. It is the faith of the mighty in the midst of the snows. It is the crystal of comfort in a cake of ice.

Yet this same philosophy of the stoic North has enabled us to vote the Republican ticket for half a century and pay higher tariff duties at the same time, without flinching. What Prometheus could dare for more?

I appreciate our fleeting summers because I have never lived through a California winter in B. V. D.'s, or puddled through any of Oregon's winters in a raincoat. As I take the moth-balls from the pockets of my frayed balbriggan for another cold wave, it is with no sigh of resignation or sense of thwarted hopes. Furthermore, I am very proud of a paisley scarf my wife bought for me, with more discrimination than is usual with neckties. So I welcome the falling mercury as a chance to display it.

This reminds me to ask what do the doting grandmas do in the winterless climes with no lumpy woolen socks, gaudy wristlets, and kid mittens to knit and darn? Likewise and more pertinent still, what can possibly induce and prolong a first class Thanksgiving appetite in milder states than ours? What are the Christmas substitutes out there for chimneys, that lead to expectant stockings and sleigh-bells that lull to dreamland?

We were raised on the traditions of frigid New England and we settled the West with brawn built out of pumpkin pies and baked beans. Climates that encourage hot tamales and mint juleps do not jibe with our inherited and acquired personal prejudices.

OF course in our own slushy cities there *are* children so bereft of their rights that they have never heard a sleigh-bell or seen a cutter or a bob—except in the barber shops. To them the change from the vernal equinox to the radiator knocks means less of parks and more of janitors. This superficial shielding and softening of the resistance and the senses is something to be condoned in our modern method of child rearing.

In my garden the last mosquito has gone and the last tomato is harvested. I have yanked up the incomplete cantaloupes and the tentative turnips, sinking my spade in the earth with fond hopes of longer growing seasons

and earlier varieties next year.

My neighbor goes away with a gun on his shoulder for duck shooting forays, probably to return via the meat market under cover of the dusk. It is the last call for outdoor sporting, and I long to join him in his tramp before the season of artificial amusement begins.

As the period of parlor pastime draws nigh, the obliging husband keenly realizes that the great bridge expert is aptly named Work. To us fellows with no memory for cards played and unplayed, dental bridge holds no greater terror than the other kind. There are folks, however, who insist that bridge makes a long winter evening shorter, but they usually hold the aces.

LIKE most public men, I think best while on my feet. Hence I would enjoy playing a bridge game standing up, with the result that I might not be "set" quite so often. Waiting so long for some "specialist" to think hard and get the upper hand on me is indeed debilitating. And the acrid aftermath of trumping your partner for a loss! I verily believe that bridge holds the only post-mortem where the deads ones are conscious of it. But in order not to spoil somebody's round of pleasure, I crowd my knees under the table, grit my teeth, and blunder along. I am sure of grabbing the little prize they hand out with a ha-ha.

Then, of course, some blustery night it's time to attend a dancing party. Just as you get into your slippers for another selfish evening, your Best Friend reminds you that the Bore-climbers are throwing a shuffle fest. Sure, you'd like a chance to wear the tux after investing so much in overhead to wear over your underwear. The only time that it gets the air otherwise is at spring house-cleaning.

The honorable Farm Board itself could not relieve the pangs of a surplus corn crop under these circumstances. But spavins, spring-halt, and ringbone make no difference after the music starts and the first heat is run. Stirrings of forgotten money-musks and devils' dreams loosen our rusty shanks and bring us the blessings of joy after a preamble of grumbling. If by modern fad some old-time fiddler has been secured for the event, the years reel off like a cinema of the centuries until Home Sweet Home reminds us of a furnace to be banked and morning paths to shovel.

Aurora borealis twinkles above us as we stumble home through the muffled drifts. Its gleam reminds us in this mood of gayety how we used to pile into mammoth country bob-sleds with bags of pop-corn balls and palpitating hearts. Taxis and tuxes did not fret us in those halcyon days of hilarity. Nowadays they legislate the narrow sleigh to the backwoods and travelers prefer to roll instead of sliding.

THE list of abandoned winter traditions are many. My children have never ridden in a sleigh, have never seen a kerosene lamp, have never thawed out a pump, have never worn red flannels. They have never arisen in their shirt-tails on a frigid morning to kindle a fire in the cook stove with corn-cobs and cuss words. Thank heaven, they have never seen me attempt to wrestle a two-ton, eight-foot base burner through a newly varnished door and across a cherished rag carpet made from my fat aunt's wedding dress. They have been spared the sounds accompanying the fitting of stove pipe and wire. They have never found the family dipper frozen solid in the water pail. They have never wound the clock and coaxed out the cat. Almanacs mean nothing to them and the sun-dogs bark in vain. In other words, Winter has been reduced to Cleveland's happy phraseology, that of "innocuous desuetude."

We have actually reached a point where we are proud of our climate. I have just returned from an autumnal jaunt with some jaded Kansans browsing up among our minor mountains.

I was pleased to note that the hills our farmers call infernal, they dubbed "eternal." I have observed Jack Frost nibbling at the trees and shrubs ever since I was a child, but it took the appreciation of southern friends to stir my pride in it.

In one spot in particular they halted the parade to pause and drink in this visual nectar. Oaks, maples, and brilliant sumac bushes had felt the first dab of winter war paint and had spread an oriental rug to soften the pathway of departing summer.

They forgot to ask me again how cold it got in January, but they were elated to think they had visited us when the real estate was looking even better than the prospectus prophesied.

SO, like the squirrels, we know full well that the season of cloistered congeniality is approaching and sense it in the whiff of the leaf fires and the tang of the November breeze. We, too, busy ourselves gathering a few herbs and nuts together to fortify the stores of eatables required to meet the rigors of the dormant time.

Human and animal life in the North share a common beleaguered brotherhood as the days get shorter and the rivers darken and congeal. But just as the bear and the groundhog retire to dream anew of the blueberries, wild honey, and toothsome roots of 1930, we likewise sort our canned goods and calculate our coal piles with hopeful minds on the spring surcease.

Somehow, we never think with dread about the spring mud or the barrowfuls of cinders, the leaky roofs and the high cost of keeping comfortable. In a pinch we can go to the library and borrow books on the tropics or scan some of the latter day literature one handles with tongs. Or possibly a political argument will provide a little free heat by friction.

Winter is the time when farm folks have time to become receptive audiences and extension workers extend themselves by every means in their power. It must be hard to be an agriculturist in climates without a recess.

I know farmers who have made more money with a lead pencil and self-analysis in winter than they did all summer long. The radio reception is better on clear, cold nights and the rural mail carriers tote college courses to stable seminars.

Yonder soil under its coverlet of snow and ice now becomes a tantilizing puzzle to be solved with the solvent of modern methods. By study and testing in winter one finds that the cows deemed to be gold mines were simply gold minus.

To the studious farmer guess-work glimmers away when the thaws come in the spring. Old-timers used to keep a pack of cards for a winter tournament of old sledge, but the farmer of today uses his cards to make an index. The farmers of today spend the winter in absorbing something besides bad air and batter cakes.

HENCE we shall hibernate with malice toward none and with expectations of a ninety per cent hatch in the spring. Should you chance upon any helpful literature that might aid us in fomenting some critical commentaries, send it to the tolerant publishers, who are familiar with our whereabouts.

Once more I go out and look at my thermometer. My only fear is that its longitudinal capacity below the thirty-two degree mark is not going to be sufficient. However, it is a good stout weather glass which has stood the attack of many gales and glaciers. No matter what it does, I am going to believe it religiously and govern myself accordingly.

So I accept my climate and adopt my winter without apology to readers in fancier places. Every time it hits me a slap in the face, I imagine I am not getting worse treatment than I earned.

And thus I close with good wishes and a polar period.

STOP—LOOK—LISTEN

"Hey, Mike," said a workman to his fellow laborer, "Don't come down that ladder on the north corner. I took it away."—*Fyr-Fyter News.*

President Hoover has smashed another precedent, and now follows Mrs. Hoover down the aisle or into the limousine, despite the rule that the President must go first, and we honor him for it, although, of course, it may be that he got tired of being told that his coat needed pressing.

Two ladies stopped at a livery stable and asked for a gentle horse to drive.

The liveryman brought out one, saying: "This horse is perfectly gentle so long as you don't let the rein get under his tail."

Within a few hours they returned. "How did you get along?" asked the liveryman.

"Oh, we got along just fine. Had a couple of showers while we were out, but we took turns holding the parasol over the horse."

The teacher was reading the story of the man who swam across the Tiber three times, when a small boy sniggered.

"Don't you believe he did it, Jimmy?" the teacher asked.

"Yes, I believe it," Jimmy answered, "but I wonder why he didn't make it four times and get back to the side where he left his clothes."

—*Tit-Bits (London).*

"Does yo' take this woman for thy lawfully wedded wife?" asked the colored parson, glancing at the diminutive, watery-eyed, bow-legged bridegroom, who stood beside two hundred and ten pounds of feminine assurance.

"Ah takes nothin'," responded the bridegroom, gloomily. "Ah's being tooked."—*Tit-Bits (London).*

"FIRST THINGS FIRST"

"A story is told of a Durban gentleman who had a farm in the Eastern Transvaal. This man knew very little about farming, and had only a limited amount of money. Running short of cash, he telegraphed to his manager, "Shear the sheep as soon as possible." His manager wired back: "Impossible to shear the sheep; the ewes are lambing." So again he telegraphed, "Stop the lambing and go on with the shearing."

Wifie: "It's my birthday today, and you haven't remembered!"

Hubby: "My dear, how should I remember? You don't look a day older!"

"Dey ain't no justice no mo'," mourned Rufus to a friend. "Ah's a sick man. Guess Ah's gwine to die suah. De doctah says my veins is too close an' dat Ah got very close veins, an' de only help fo' me am to eat chicken broth three times a day an' stay in nights. An dat jet' can't be done."

Your

Citrus Trees

need

Potash

with every meal

EVERY time you feed your trees feed them balanced plant food with plenty of potash. This develops fine-textured, high quality fruit and also produces and fills out growth in which food is stored for future crops. Citrus trees require a balanced ration to be healthy, vigorous, and productive. Feeding them an incomplete fertilizer is like feeding a growing child meat alone.

For example, nitrogen is an essential plant food element. Yet, nitrogen used alone produces a vegetative tree of slender growth, subject to frost damage, dieback, and ammoniation. Plenty of potash is needed to fill out this growth and store food for fruit bud differentiation. Sturdy, short, thick growth enlarges your bearing surface and develops a well-balanced tree.

Every time you fertilize your trees see that they get plenty of potash. This promotes a crop with good finish that holds up well on the market. It also gives your trees a good start on their next crop making them healthy, strong, and less susceptible to winter injury. Potash helps you make a good crop year after year.

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